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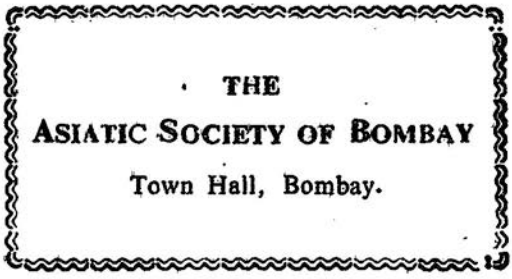

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THE

TRANSACTIONS

OF THE

BOMBAY GEOGRAPHICAL SOCIETY.

FROM JANUARY 1863 TO DECEMBER 1864.

(EDITED BY THE SECRETARY.)

VOLUME XVII.

Bombay:

PRINTED AT THE

EDUCATION SOCIETY'S PRESS, BYCULLA.

MDCCCLXV.

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RULES AND REGULATIONS.

1*st.*—This Society, established for the purpose of encouraging and instituting Geographical researches in Western Asia and the countries contiguous, is denominated the "Bombay Geographical Society."

2*nd.*—The Society shall consist of Honorary and Ordinary Members.

3*rd.*—Every candidate for admission, whether as an Ordinary or Honorary Member, must be proposed and seconded at one Meeting of the Society, and balloted for at the next.

4*th.*—No person shall be considered duly elected, unless he unite in his favour the votes of three-fourths of the Members present.

5*th.*—An annual Subscription, amounting to Rs. 15, to be paid by all Members in advance, on the 1st of April of each year.

6*th.*—Members may compromise by a single payment of Rs. 100, instead of a payment of Rs. 15 annually.

7*th.*—*Of the Office-Bearers and Committee.*—The Office-Bearers shall consist of a President, a Secretary, and Treasurer,—permanent; three Vice-Presidents and a General Committee of Management (consisting of 20 Members) to be chosen annually.

8*th.*—That the Committee of Management and other Office-Bearers of the Society eligible annually, shall be chosen by general vote of the Ordinary Members, to whom voting lists shall be forwarded three months previous to the Anniversary Meeting, at which the returns shall be scrutinized and announced.

9*th.*—Two Sub-Committees, consisting of six Members each, shall be annually selected from among the Resident Members of the General Committee, at the first meeting after the annual election of the latter. The Sub-Committee having the superintendence of all the internal management, accounts, &c. of the Society, shall be denominated the "Sub-Committee of Accounts": the other shall conduct the correspondence of the Society, and suggest plans for attaining its scientific objects —to be called "The Sub-Committee of Correspondence."

10*th.*—The Secretary shall be a Member of the Committee of Management *ex-officio.*

11*th.*—Each Sub-Committee can meet independently of the other for the purpose of discharging the business especially entrusted to it; and the meeting shall be summoned by a circular from the Secretary.

12*th.*—The Sub-Committee of Accounts shall lay before the Annual General Meeting, to be held in May or April of each year, the state of the Society's Funds. The Sub-Committee of Correspondence shall lay before the same Meeting a list of the Scientific Contributions made to the Society during the year.

13*th.*—Each Sub-Committee shall elect from among its Members a President to preside at its meetings.

14*th.*—The President shall preside at the General Meetings of the Society, to conduct the Proceedings, and give effect to the Resolutions.

15*th.*—The Vice-Presidents shall preside at the General Meetings in the absence of the President, and in rotation at Meetings of the General Committee of Management.

16*th.*—The Secretary shall attend the Meetings of the Society and those of the Committee, to record their proceedings and conduct the correspondence. He shall also superintend the persons employed by the Society, and, under the control of the Committee for managing the accounts, shall superintend the expenditure of the establishment.

17*th.*—The Treasurer will receive, through the Secretary, all moneys due to the Society, and make payments out of the funds of the Society according to the directions of the Secretary.

18*th.*—The Society shall meet on the third Thursday of every month at 4-30 P.M.

19*th.*—Notice shall be given, either at a previous Meeting or to the Secretary, of any motion or subject of discussion intended to be brought before the Meeting, at least one week before hand, and all matters of business, &c. intended to be brought before the Society, shall be notified to the Members by printed circulars.

20*th.*—Each Member may introduce a friend to all ordinary Meetings of the Society.

21*st.*—The Society shall present copies of its Transactions to the principal Public Libraries in India, Europe, and America, and exchange

them with Societies, and with such authors or publishers as may be disposed to bestow works of equivalent value, or nearly so, on the library of the Society.

22*nd*.—All Members of the Bombay Branch of the Royal Asiatic Society are entitled to be admitted Members of the Geographical Society, on making application to this effect through the Secretary, and paying the prescribed annual subscription.

LIBRARY REGULATIONS.

The following are the Rules in force for the management of the Library :—

1. The Books of the Geographical Society's Library may be taken out by Members, subject to the following exceptions and restrictions.

2. No Book shall be delivered out by the Librarian, unless the Member requiring it shall either sign the entry in the Register, or send a receipt to him.

3. No Member shall keep any Book longer than fourteen days.

4. Any Member requiring a Book which has been delivered out, may insert, or cause to be inserted, his name in a Register kept for that purpose ; and it shall be the duty of the Librarian to apply for it as soon as the period specified in the above rule has expired, and, on receipt, to forward it to the first on the list of applicants if there be more than one.

5. Not more than three volumes to be taken out at one time by any Member.

6. The Librarian shall inspect carefully every Book at the time it is returned, and, if damaged, shall report the circumstance to the Secretary.

7. Any Book lost or damaged, shall be charged to the Member in whose name it stood in the Register, at the invoice price, or such price as shall be fixed by the Committee of Management.

8. Members leaving Bombay, are required to return, before their departure, to the Library, all Books belonging to it in their possession, —and no Book shall be carried out of Bombay.

9. No Map, Chart, Atlas, or Book of Reference, shall be taken out, without express permission from the Committee of Management, except Books of Reference (for 48 hours) on the order of the Secretary to that effect.

10. Any Member may propose Books, Charts, Maps, or Atlases, to be added to the Library, by inserting their names in a Register kept for that purpose, and they will be ordered or not as the Committee may deem expedient.

11. Every new Work, Map, Chart, &c. shall lie on the table one month before it is taken out.

BOMBAY GEOGRAPHICAL SOCIETY.

(ESTABLISHED IN 1832.)

Patron.

His Excellency the Honorable Sir BARTLE E. FRERE, *K.C.B.*,
Governor of Bombay.

President.

The Honorable WILLIAM EDWARD FRERE, C.S., *F.R.G.S.*

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BARKER, Captain W. C.
BLACK, Captain Thomas.

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JACOB, Genl: G. LEGRAND, *C.B*
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Treasurers.

Messrs. REMINGTON and Co.

Clerk.

BULWANT KRISHNARAO PALEKER.

Members.

(To December 1864).

[*N. B.—Those having * preceding their names have compounded for life. Those having † are absent from India.*]

Year of Election.		Year of Election.	
1855	† Anderson, the Honorable H. L., C. S.	1864	†Gell, the Rev. F., *B.A.*
		1861	Glasse Surg Major H.D.
1862	Annesley, Major J. T.	1862	†Grant, Sir Alexander, Bart., *M.A.*
1864	† Arnot, Lieut. W. P.		
1859	Atmaram Pandoorung Esq., *G.G.M.C.*	1864	Gumpert, A. C., Esq.
		1849	Haines, R., Esq., *M.B.*
1843	* Barker, Captain W. C.,	1864	40 Haylar, T. C., Esq.
1862	† Barr, Colonel H. J.	1859	Heycock, Edwin, Esq.
1853	* Bhàu Daji, Esq., *G.G. M.C.*	1864	Heythuysen, Captain Van
		1863	Homejee Cursetjee Dady,,
1864	Bhugwandass Purshotumdass, Esq.	1860	†Hope, T. C., Esq., C. S.
		1862	Hughlings, Prof. J. P. *B.A.*
1859	Birdwood, G.C.M., Esq., *M.D.*	1836	*†Jacob, General G. Le Grand, *C.B.*
1861	10 Black, Captain Thomas.	1851	Jejeebhoy, Sir Jamsetjee, Bart., *F.R.G.S.*
1864	Brasher, A., Esq.		
1862	Burgess, J., Esq., *F.E.I.S*	1864	Jones, Colonel J., R. E.
1863	Burjorjee Sorabjee Ashburner, Esq.	1850	Jugonathjee Sunkersett, the Honorable.
1861	† Burn, Lieut. H.	1863	50 *Kama, K. R., Esq.
1864	† Burns, Lieut. H.	1864	Kane, M., Esq., *M.D.*
1860	Byramjee Jejeebhoy, Esq.,	1863	Karsendass Madhavdass, Esq.
1862	Campbell, Surgeon Major W., *M.D.*	1846	*Kemball, Colonel A. B. *C.B., F.R.G.S.*
1863	Candy, Prof. J. F., *M.A.*		
1864	†Carpendale, Lieut T.C.S.	1856	Kennelly, D. J., Esq., Corresponding *F.R. A.S., F.R.G.S.*
1862	20 Coghlan, W.M, Esq., C.S.		
1864	†Connon, J., Esq.		
1864	Crockett, Lieut. W. T.	1863	Keir, C. M., Esq.
1863	Cawasjee Jehangeerjee Readymoney, Esq.	1864	King, F., Esq.
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1863	Cawasjee Manockjee, Esq.	1863	Lalor, Dr. James, *B.A.*
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1864		Morrison, F. A. R., Esq.
1855		Munguldass Nuthoobhoy, Esq.
1848	70	Munmohundass Davidass, Esq.
1853		Narayan Daji, Esq. *G.G.M.C.*
1854		Narayan Dinanathjee, Esq.
1864		Newnham, Cornet T. J.
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1864		Niven, W., Esq., *M.D.*
1863		†Parker, Lieut. G.C.
1864		Pelly, Surgeon Major S. M., *F.R.C.S.*
1860		Pelly, W. A., Esq.
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1864	80	Premchund Roychund, Esq.
1864		Pringle, R. J., Esq.
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1860		Reid, R. T., Esq., LL.D.
1862		†Repton, E. P., Esq.
1849		†Ritchie, John, Esq.
1859		Robinson, Commander G.T.
1851		†Ross, Dr. J. T. C.
1863		Rustomjee J. Jejeebhoy, the Hon'ble.
1863		*Rustomjee Ardeseer Wadia, Esq.
1863	90	Sands, J., Jr., Esq.
1864		Scorgie, J., Esq., F.C.S.
1862		Scott, The Hon'ble H. M.
1862		Searle, Lieut. W. L., *F.R.A.S.*
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1855		Sorabjee J. Jejeebhoy, Esq.
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1864		Sorabjee Framjee, Esq.
1864		Souter, F. H., Esq.
1863		Stearns, W. F., Esq.
1863	100	†Steel, G., Esq.
1862		†Stevens, W. T., Esq.
1859		†Stiffe, Lieut. A. W., *F.R. A.S.*
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1860		Sylvester, Dr. J. H., *F.G. S*
1864		Tapp, Brigadier Genl. T., *C. B.*, A. D. C. to the Queen.
1864		Taylor, James, Esq.
1863		Terry, G. W., Esq.
1849		Venayekrao Jugonathjee, Esq.
1856		VenayekraoWasoodewjee, Esq.
1859	110	Virjeewandas Madhavdas Esq.
1859		*Vishwanath Narayan Mandlik, Rao Saheb.
1864		Ward, Surgeon Major W. T., *F.R.C.S.*
1862		†Welsh, Dr. James, *F.R. C.S.*
1859		†Williams, Lieut. R.
1854		†Willis, R., Esq.

Honorary Members.

The following list contains the names of those who have been elected Honorary Members of the Society from its original institution to the present time:—

Avazac, Monsieur D'.
Bache, Professor A.D., *U.S.C.S.*
Bergans, Professor Heinrich.
Du Pont, Captain, U. S. Navy.
Greni, H. E. M. La.
Johnston, Alex. Keith, Esq., *F.R.S. E.*
Jomand, Monsieur E. F., Mem. Inst. France.
Krapf, the Rev. Dr. J. Lewis.
Kupffer, Professor M. A. T., St. Petersburgh.
Leeke, Admiral Sir H., *K.C.B.*, *K.H.*
Loyd, R. Humphrey, Esq.
Lyell, Sir Charles, *M.A.*, *LL.D.*, *F.R.S.*
Markham, C. R., Esq. *F.R.G.S.*
Maury, Admiral M. F.
Morreau, Cæsar, Esq.
Oberreit, Major General.
Sabine, Major General Edward, R. A.
Schlaginweit, Herman de, Esq.
Shaw, Dr. H. Norton, *M.R.C.S.* &c.
Somerville, Mrs. Mary.
Washington, Admiral J., R.N., *F. R. S.*, Hydrographer to the Navy.
Wellesley, Admiral G.G., *C.B.*, R.N.

LIST OF PUBLIC INSTITUTIONS, &c.

TO WHICH COPIES OF THE TRANSACTIONS ARE PRESENTED.

GREAT BRITAIN AND IRELAND.

Aberdeen University Library.
Antiquaries, Society of.
Asiatic Society, President of the.
Athenæum Newspaper.
British Museum, Library of the.
Cambridge University Library.
Dublin University Library.
Edinburgh University Library.
Glasgow University Library.
Hakluyt Society.
Hydrographer of H. M.'s Lords of Admiralty.
Literary Gazette.
Literary and Philosophical Society of Manchester.
Oxford University Library.
Peninsular and Oriental Steam Navigation Company.
Queen's College, Cork, Library of the.
Ditto Belfast, Library of the.
Ditto Galway, Library of the.
Royal Asiatic Society of Great Britain and Ireland.
Royal Geographical Society of London.
„ Geological Society.
„ Institution of Great Britain.
„ Irish Academy.
„ King's College.
„ Naval College.
„ Society of Edinburgh.
St. Andrew's University Library.
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EUROPE.

Berlin Geographical Society.
Darmstadt ditto.
Frankfort ditto.
Munich Royal Academy of Sciences.
Paris Asiatic Society.
„ Ethnological Society.
Paris Geographical Society.
„ Oriental Society.
„ University Library.
St. Petersburgh Imperial Geographical Society.

ASIA.

Ahmednuggur Establishment for the Bombay Artillery.
Ahmednuggur Native Library.
Bombay Benevolent Library.
„ Branch Royal Asiatic Society.
„ Byculiah Boys' School.
„ Chamber of Commerce.
„ Elphinstone Institution.
„ Fort Improvement Library.
Bombay Grant Medical College.
„ Mechanics' Institution.
„ Medical and Physical Society.
„ Native General Library.
„ Naval Institution.
„ Naval Sanitarium.
„ Observatory.
„ Students' Literary and Scientific Society.

Bombay. The "Bombay Gazette."
„ The "Bombay Guardian."
„ The "Times of India."
„ The "Bombay Saturday Review.
Calcutta, Asiatic Society of Bengal.
„ Director of Public Instruction.
„ Saint Andrew's Library.
„ Surveyor General's Office.
„ The "Bengal Hurkaru."
„ The "Calcutta Review."
Calcutta, The "Englishman."
„ The "Friend of India."
Ceylon, Asiatic Society.
Kurrachee, Native Library.
Madras, "Athenæum."
„ Literary Society.
„ Observatory.
„ Trevandrum Observatory.
Poona Library.
Surat Library.
Tanna Library.

AFRICA.

Cairo Literary Society.
Mauritius Meteorological Society.
Mauritius Royal Observatory.

AMERICA.

New York Geographical and Statistical Society.
Washington Smithsonian Institution
Washington National Observatory.

AUSTRALIA.

Sydney, St. Paul's College, Library of.

ALPHABETICAL LIST OF DONORS.

Barker, Captain W. C.
Birdwood, G. C. M., Esq. *M.D.*
Burgess, J., Esq., *F.E.I.S.*
D'Avezac, Monsieur M.
Guldberg, C. M., Esq., Christiania.
Kjerulf, T., Esq., Christiania.
Morgan, Esq.
Morris, Lieut. H., R. N.
Mohn, H., Esq., Christiania.
Oldham, Dr. T.
Quaritch, B., Esq.
Sars, Dr. M., Christiania.
Schubeler, Dr. F. C., Christiania.
Stamford, Edward, Esq.

SOCIETIES AND INSTITUTIONS, &c.

Agri-Horticultural Society of Western India.
Bengal Government.
Bombay Branch Royal Asiatic Society.
Bombay Chamber of Commerce.
Bombay Government.
Bombay Students' Literary and Scientific Society.
Ceylon Branch Royal Asiatic Society.
Director of Public Instruction.
Geographical Society of Paris.
Geological Society of Germany.
Geological Society of Munich and Vienna.
Hakluyt Society.
Meteorological Society of Mauritius.
Principal Inspector General Medical Department.
Royal Asiatic Society of Great Britain and Ireland.
Royal Grographical Society of London.
Royal Institution of Great Britain.
Royal Observatory, Greenwich.
Royal Society of London.
Society for the Publication of Prubhoo Calendar.

PROCEEDINGS

OF THE

BOMBAY GEOGRAPHICAL SOCIETY.

SESSION 1862-63.

FIFTH MEETING.—*January 15th*, 1863.

THE ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 15th instant, at half past 4 P.M.

Present.—The Honorable W. E. Frere, C.S., *F.R.G.S., President*; Captain W. C. Barker, I.N., *Vice-President*.

Members.—J. Burgess, Esq., *F.E.I.S.*; Lieutenant E. F. T. Fergusson, I.N., *F.R.A.S.*; Lieutenant H. Burn, I.N.; Venayekrao Jugonnathjee, Esq.; Mummobhandas Davidas, Esq.; J. E. C. Pryce, Esq.; the Rev. W. K. Fletcher, M.A.; Atmaram Pandurung, Esq., *C.G.M.C.*; Captain Mohammed bin Hamees; and D. J. Kemsley, Esq., I.N., *Secretary*.

The Minutes of the last Meeting were read and confirmed.

Election.—Dr. James Lalor, B.A.

Member proposed.—Sorabjee Pestonjee Framjee, Esq.

Donations.—The following donations were laid before the Society, for which their best thanks were directed to be given to the donors:—

1.—Report of the Bombay Chamber of Commerce, for the year 1861-62. By the Bombay Chamber of Commerce.

2.—A Catalogue Raisonné of Rare, Valuable, and Curious books. By B. Quaritch, Esq.

Letters read.—1.—From Venayekrao Jugonnathjee, Esq.

2.—From Professor J. P. Hughlings, B.A.

3.—From the Honorable A. D. Robertson, Secretary to Government, General Department, acknowledging the receipt of a letter from the Secretary, and informing in reply, that His Excellency the Governor in Council has been pleased to subscribe for (10) ten copies of Messrs. Schlagintweits' cheap edition of their Second Volume of "General Hypsometry of India and High Asia."

4.—From Thomas Black, Esq., Superintendent P. and O. Company, forwarding the following extracts relative to the late Cyclone, agreeably to his promise at the Society's last meeting:—

Extract of a letter from Captain W. CURLING, *of S. S. "Nepaul," dated Suez, 28th December* 1862.

"Herewith I enclose you copy of our Log during the Hurricane we encountered off the Seychelles on our last voyage.

"You are no doubt aware, that hitherto that locality has been considered safe from these gales, and hence, until I found the barometer falling fast, and the wind increasing to a storm, I did not apprehend anything serious.

"We had had on October 10th to noon of the 11th a strong squally SE. trade, with heavy SE. swell and sea, but this was usual.

"But at noon on the 11th, being by account (no observation) about 70′ SE. of the Seychelles (Mahé), very dirty weather and barometer then 29°75, I determined to round to and stand back, and did so at 2 P.M. The wind then steady SE., heavy sea and rain, and we were then only 50 miles from Mahé.

"The wind and sea continued increasing to hurricane violence until 4 A.M. on the 12th, and then began to abate somewhat, and the wind inclined to veer to eastward, and at 8 A.M. the wind was E.; wind and sea decreasing.

"The wind with us was from SE. to E. only.

"We stood from 2 P.M. the 11th until midnight the 12th to SE., but found on arriving off Mahé we had been sent fully 30′ to the Westward.

"At Mahé the gale began at SE. the afternoon of the 11th; gradually the wind drew round by S. to W. and NW. with them, and it was from this last quarter, about 6 to 10 A.M. on the 12th, that they experienced its greatest violence.

"We think it was undoubtedly a hurricane, and that it passed to the N. of us, and right over the Seychelles. The accounts given of the wind, &c. at Seychelles are very imperfect, it being very high land all round; and during the worst of the weather the town was in deep distress, from a vast torrent, mingled with huge rocks, passing over it, killing 70 persons.

"Our barometer was 29·40 at 2 A.M. on the 12th, at Seychelles 29·50 at 9 A.M.

"The ship behaved remarkably well: nothing broke or gave way. We lost our two waist cutters, for the sea was very heavy, and sweeping at times almost over us.

"But the wind was steady and sea regular, and as soon as the wind inclined to the E. of SE., the barometer began to lift."

Peninsular and Oriental Company's Steam Ship "Nepaul," from Reunion towards Mahé.
Friday, October 10th, 1862.

Hours.	Courses.	Knots.	Fathoms.	Winds.	Barometer.	Sympieso-meter.	Thermo-meter.	Revolu-tions per Minute.	Inches in the Well.	Remarks, &c.
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

	Courses made.	Distance.	Latitude.	Longitude.	Variation.	Draft of Water	Bearing and Distance at Noon.
Obsn.	N 5° E.....	260	9·38	Acct. 58·02....	A.M. Azh. 1° West .... P.M.	Fwd. Current	Fortunes Bank, N 15° W 147 miles.
				Chron. 57·59 ..			
Acct.	N 7° E.....	249	9·48	☉ and ☾	A.M. Amp. ..... P.M.	Aft. N30°W10miles	

1	N 5° W. ..	11	2	ESE.....	....	....	....	....	....	Strong breeze and cloudy, with heavy SE sea on.
2	,, ...	11	2	....	....	....	....	....	....	Ship rolling heavily and taking in much water.
3	,, ...	11	2	....	....	....	....	....	....	
4	,, ...	11	2	ESE.....	29·95	....	78	63	....	Same weather. Reefed trysails and furled main-topsail.
5	,, ...	11	4	....	....	....	....	....	....	Hard squalls, with heavy rain.
6	,, ...	11	4	....	....	....	....	....	....	Visited holds and saw fire-gear ready.
7	,, ...	11	4	....	....	....	....	....	....	Blowing hard with a high SE sea running; the ship rolling heavily and shipping much water fore and aft.
8	,, ...	11	4	ESE.....	29·94	....	78	63	7	
9	,, ...	11	4	....	....	....	....	....	....	9*h*.—Out lights forward. 10*h*.—Squally appearance to eastward; close reefed fore-topsail. 10*h*. 30*m*.—Out all lights.
10	,, ...	11	4	....	....	....	....	....	....	
11	North	11	4	....	....	....	....	....	....	Strong wind and overcast weather, with a heavy easterly sea.
12	,, ...	11	4	ESE.....	29·93	....	74	63	....	Ship rolling heavily and shipping much water.

BOMBAY GEOGRAPHICAL SOCIETY.

Peninsular and Oriental Company's Steam Ship "Nepaul," from Reunion towards Mahé.
Saturday, October 11th, 1862.

Hours.	Courses.	Knots.	Fathoms.	Winds.	Barometer.	Sympiesometer.	Thermometer.	Revolutions per Minute.	Inches in the Well.	Remarks, &c.
1	North	11	2	ESE.....	....	.....	....	....	....	Fresh gale and cloudy, with drizzling rain and heavy SE sea on.
2	,, ...	11	2	....	....	....	....	....	....	
3	N by W ..	11	2	....	....	....	....	....	....	
4	,, ..	11	2	ESE.....	29·90	....	72	62	....	Fresh gale, with constant heavy rain.
5	NNW	11	2	....	....	....	....	....	....	Trimmed sail in trysails.
6	,, ..	11	2	....	....	....	....	....	....	Strong gale, with heavy rain and thick weather; high flowing sea.
7	NW by N.	11	2	....	....	....	....	....	....	
8	NW	11	2	ESE.....	29·88	....	77	62	7	Wind very variable, with same weather. Crew employed variously, making everything well secure for bad weather.
9	,, ...	11	2	SE	....*	....*	....*	....*	....*	
10	,, ...	11	2	....	....	....	....	....	....	Noon; fresh gales with constant heavy rain and very heavy sea, with dirty threatening weather, very heavy sea on. Ship taking in much water. Prepared to round ship to.
11	,, ...	11	2	....	....†	....†	....†	....†	....†	
12	,, ...	11	2	....	29·78	....	75	61	....	

* Shaik Adam, Agwallah.
Ismaul Dawood, Lascar. } *Sick.*
Dawood Muhomed.

† Coal ..... 279 tons.
Consumed.. 23 ,,
Remaining . 256 ,,

	Courses made.	Distance.	Latitude.	Longitude.	Variation.	Draft of Water.	Bearing and Distance at Noon.
Obsn.	No observation.	....	....	Acct. 58°35′ .. Chron.	A.M. Azh. ..... P.M.	Fwd.	Mahé Island, N 48° W., 89 miles.
Acct.	N 19° W	260	5°32′	☉ and ☾	A.M. Amp. ..... P.M.	Aft.	Distance at 2 P.M. N50°W., 55 miles.
1	NW.	11	2	SE	....*	....*	....*	....*	....*	Strong gale, with very heavy squalls and constant heavy rain. 0h. 30m.—In all sail. 1h.—Port cutter washed away.
2	,, ...	11	2	....	....	....	....	....	....	
3	SE.	2	....	....	....	....	....	....	....	
4	,, ...	2	....	SE.	29·63	....	74	40	....	Bent storm trysails and housed topgallant masts.
5	SE ½ E. ..	1	4	....	....	....	....	....	....	Strong gale with heavy sea and constant rain.
6	,, ..	1	4	....	29·65	....	....	....	....	
										Visited holds and saw fire-gear ready.
7	SE ½ E. ..	2	4	....†	29·68	....†	....†	....†	....†	8h.—Heavy gale with constant rain and thick weather.
8	,, ..	2	4	....	29·70	....	78	40	7	Very violent gusts at times and a high sea; shipping large quantities of water fore and aft.
9	,, ..	2	....	....	29·65	....	....	....	....	
10	,, ..	2	....	....	29·60	....	....	....	....	9h.—Out lights forward. 10h. 30m.—Out all lights.
11	from SE ½ E. ..	2	....	....	29·58	....	....	....	....	Blowing a very heavy gale, with very high sea and constant heavy rain. Shipping much water.
12	to South	2	....	SE.	29·55	....	73	42	....	

* At 2 P.M., the weather being very dirty, and barometer falling, rounded ship to, as per column.
† Sounded no ground at 60 fathoms.

Peninsular and Oriental Company's Steam Ship "Nepaul," from Reunion towards Mahé.
Sunday, October 12th, 1862.

Hours.	Courses.	Knots.	Fathoms.	Winds.	Barometer.	Sympiesometer.	Thermometer.	Revolutions per Minute.	Inches in the Well.	Remarks, &c.
1	SE.	1	....	SE	29·50	....	....	....	....	Heavy rain, with strong gale and furious gusts, and a very heavy sea. Shipping much water over all.
2	South.	1	....	....	29·45	....	....	....	....	
3	SE.	1	....	ESE.....	29·40	....	....	....	....	3h.—Same weather; ship rolling heavily; starboard cutter washed away.
4	SE.	1	....	....	29·42	....	78	41	....	Blowing furiously; weather very thick, and rain falling in very heavy torrents, with a high mountainous sea breaking over the ship fore and aft.
5	ENE	1	....	E by S....	....	....	....	....	....	
6	ENE	1	....	East	29·48	....	....	....	....	6h.—Wind veering; put ship's head to the S and E.
7	SE	1	4	E by N....	....	....	....	....	....	
8	„	1	4	EN	29·54	....	78	40	8	8h.—Same weather, but gusts less violent; a very heavy sea still running.
9	„	2	....	EN	29·55	....*	....*	....*	....*	
10	„	2	....	EN	29·60	....	....	....	....	
11	„	2	....	EN	29·45	....†	....†	....†	....†	11h. 50m.—Stopped for sounding; no bottom with 60 fathoms, went on again.
12	„	2	....	....	29·73	....	76	42	....	Noon; wind moderating with less sea, heavy appearance to eastward.

* Shaik Adam, Agwallah. }
Hanjee Abdulla, ditto. }
Ismaul Dawood, Lascar. } *Sick.*
Dawood Mahomed, do. }
Ally Arab, do. }

† Coal ..... 256 tons.
Consumed .... 20 „
Remaining .... 236 „

	Courses made.	Distance.	Latitude.	Longitude.	Variation.	Depth of Water.	Bearing and Distance at Noon.
Obsn.	No observation.	....	....	Acct. 56°27′ .. Chron.	A.M. Azh. None ..... P.M.	Ford.	St. Anne's, N 51° W., 66 miles.
Acct.	N 41° W	11	5°19′	⊙ and ☾	A.M. Amp. ..... P.M.	Aft.	

1	ESE.	2	....	E by N	....	E by S ½ S	....	....	....	Wind and sea moderating, with heavy rain.
2	....	4	....	....	....	....	....	....	....	Long. Obs. (Indiff.) 56°53′ E.
3	....	3	....	....	....	....	....	....	....	Wind and sea still moderating.
4	ESE.	3	....	E by N	29·75	E by S ½ S	76	33	....	Heavy appearances to SE., with head southward.
5	....	4	....	....	....	....	....	....	....	
6	....	4	....	SE	29·85	....	....	....	....	Visited hold and saw fire-gear ready.
7	....	5	....	....	....	....	....	....	....	
8	ESE.	3	2	SE.	29·87	E by S ½ S	76	34	7	7h.30m.—Lat. by Dewtd Indiff. 5°37′ S. Increasing breeze and cloudy; lightning to ENE.
9	....	3	2	....	....	....	....	....	....	0h.—Out lights forward. 0h. 27m.—Lat. by Formalhault 5°46′.
10	....	3	6	....	....	....	....	....	....	10h. 30m.—Out all lights.
11	....	3	6	Midnight	.... *	.... *	.... *	.... *	.... *	Midnight; fresh breeze, with squally appearances to the eastward and heavy easterly swell; kept away to NNW.
12	ESE	3	2	....	29·90	....	74	35	....	

* Lat. by Account and Observation 5°45′ S.
Long. ditto ditto 56°30′ E.

Peninsular and Oriental Company's Steam Ship "Nepaul," from Reunion towards Mahe.
Monday, October 13th, 1862.

Hours.	Courses.	Knots.	Fathoms.	Winds.	Barometer.	Sympiesometer.	Thermometer.	Revolutions per Minute.	Inches in the Well.	Remarks, &c.
1	NNW.	6	4	SE	....	NW by W	....	....	....	Fresh breeze with cloudy weather.
2	....	6	4	....	....	....	....	....	....	
3	NW. W½W	5	4	....	....	NW ½ W	....	....	....	
4	....	5	4	....	....	....	....	....	....	Not able to get observations.
5	....	5	4	....	....	....	....	....	....	Decreasing breeze with cloudy weather.
6	NW. W½W	8	4	....	....	....	....	....	....	5h.—Went on full speed.
7	NW by N	9	....	....	....	NW by N ½ N	....	....	....	Washed deck; set square sails.
8	„ ..	9	....	....	29·05	....	78	56	?	Moderate breeze and cloudy weather.
9	NNW	9	....	....	....†	....†	....†	....†	....†	Set trysails. 10h.—Squally with rain; reefed fore-topsail.
10	„ ..	9	....	....	....‡	....‡	....‡	....‡	....‡	Unbent main-topsail to repair it. Noon observation, the Island Selhonette by NE by E 15 to 20 miles. Fresh breeze, thick rainy weather, and long easterly swell.
11	N	9	....	....	....	....	....	....	....	
12	NNE	9	....	ESE.....	29·02	NNE ..	75	59	....	

* 6h. { Lat. by Account 5°30′ S. / Long. „ 55°30′ E. / Mahi W 26 W 55 miles.

† Shaik Adam, Agwallah. / Dawood Mahomet, Lascar. } Sick. / Ismaul Dawood, ditto. }

‡ Coal ..... 236 tons. / Consumed.... 18 „ / Remaining.... 128 „

	Courses made.	Distance.	Latitude.	Longitude.	Variation.	Draft of Water.	Bearing and Distance at Noon.
Obsn.	By bearings of Selhonette.	....	4°·49′	Acct. 55·35.... Chron. By Bearing.	A.M. Been set. Azih. to Westward P.M. 30 miles.	Fwd. 13·10	Mahé east, 20 miles.
Acct.	By Account.	....	4·42	☉ and ☾ 55·5	A.M. Amp. P.M.	Aft. 15·11	By acct. N 2 W, 7 miles.
1	ENE.	7	4	ESE.	....	....	....	....	....	....	Fresh breeze and rainy weather, occasionally very thick.
2	,, ..	7	4	....	....	....	....	....	....	....	2h. 30m.—Selhonette Island north (true), distance 5 miles.
3	,, ..	7	6	....	....	....	....	....	....	....	In all sail; unstowed anchors.
4	,, ..	8	4	ESE.	29·30	....	76	59	....	....	Fresh breeze and cloudy; lead kept going. 4h. 30m.—Eased engines. 4h. 37m.—Stopped and anchored in 9 fathoms, veered to 60 fathoms cable; fired 2 guns. 5h. 15m.—Discharged Mails and received ditto for Europe; discharged cargo, passengers, and baggage. 6h.—Visited holds and saw fire-gear ready.
5	Various ..	5	....	....*	....*	....*	....*	....*	....*	....*	
6	....	..	....	....	....	....	....	....	....	....	
7	....	..	....	....†	....†	....†	....†	....†	....†	....†	7h.—Veered cable to 75 fathoms. 8h.—Light breeze, with thick cloudy weather and constant rain; set the watch. 9h.—Out lights forward. 9h. 30m.—Squally with heavy rain. 10h. 30m.—Out all lights. Midnight, light breeze with rain.
8	....	..	....	S. by E. ...	30·00	....	78	....	....	10	
9	....	..	....	....	....	....	....	....	....	....	
10	....	..	....	Variable ..	....	....	....	....	....	....	
11	....	..	....	Northerly..	....	....	....	....	....	....	
12	....	..	....	Easterly ..	....	....	74	....	....	....	

* Bearing at Anchor—
St. Anne's Peak E by N ½ N
Mahé Church W by S ¾ S } true.
Brisan's Rock N. ¾ E

† Ship in Port H. M. S. "Orestes."

5. The following from Commander W. Balfour, I.N. :—

"The Chart of the Indus' Rise and Fall for ten years, sent to the Geographical Society by Government, was constructed from the daily register which has been kept at Kotree since the day I originated it in 1844. I had the books containing this register in my hands shortly before leaving Kotree last August. They are now in the hands of Mr. W. Hughes, Engineer, who has kept the registry since the date mentioned. He is at present at Kotree, temporarily in the employ of the Indus Flotilla Company, and is perfectly competent; and I am sure will gladly give you any information in his power respecting the registry. The chart you have is not the only one. There were, I think, three others at Kotree on a larger scale, and for seven years on each sheet. I saw that, putting so many years on one sheet, would have the effect you mention, of so running the lines one into another, as to render it difficult to trace them. But the object was to supply Sir George Clerk with what he wanted, viz., a chart for a decennial period. I always intended to have had this supplemented by a copy of the daily register, and had I remained at Kotree, it would ere this have been forwarded to Government. I should mention, that a register of the rise and fall of the Mooltan river was kept by the Flotilla Officer at that station, and transmitted weekly to Kotree. The records of the Flotilla are to come to Bombay, and it will be found amongst them. Last inundation, I caused soundings to be regularly taken alongside the *Hyderabad*, to determine the rate of silt along the bank. The record of these observations, signed by Mr. McClaran, will be found as above."

The business of the Meeting having been brought to a termination, Mr. Burgess read his Paper, "Remarks on the Bombay Tidal Observations for 1861." At the conclusion of which Lieutenant Fergusson spoke to the following effect :—I beg to vote the thanks of this Meeting to Mr. Burgess, for the interesting paper he has read, as it shows that he must have taken much pains to calculate and illustrate the various particulars and details connected with the subject of tides; but at the same time there are certain points on which he has touched, on which I wish to make a few passing remarks. In the first instance I beg to state, that the formula for computing the tidal range and time of high-water given in the Observatory Volume for 1847 was, I have been given to understand, by Professor Orlebar, of the Elphinstone

Institution, and not by the late Captain Moutriou, I.N.; and that at the time he published it, he himself allowed that it was not accurate within half an hour, either one way or the other; or in other words the extent of its inaccuracy was about one whole hour. The person to whom we are indebted for the erection of the tide gauge at Colaba, was, I believe, our lamented friend the late Dr. Buist, and it was first brought into operation in January 1846. Whether the site for its erection was chosen hurriedly, or was the best at command within the Observatory compound, I cannot say, but I rather think the latter.

Professor Orlebar makes the following remarks thereon:—

"The instrument indicates neither the tide of the open sea or that of the harbour, but something between the two. It is necessary to remark here, that the position of the tide gauge was not judiciously chosen. It ought to have been established either on the sea coast or in the harbour."

These remarks, coming to my knowledge when I first took charge of the Observatory, I placed little value either in the registration of the Observatory's tide gauge, or in Professor Orlebar's formula. The tide gauge had been working for nearly six years when I assumed charge of the Observatory, and was not then in good working order, and all efforts since to render it permanently efficient have more or less failed. This, however, gave me no anxiety, as I had a formula of my own, by which I could determine the time of high-water on any given day within say "ten minutes" of the truth, which is near enough for all practical purposes, that is to say "*nautical purposes*," which I consider is all that is required.

My formula or rule for determining the time of high-water on any given day at Bombay or any other port, the establishment of which is known, is based upon the difference of its establishment and that of London Bridge. For instance, the establishment of London Bridge is 2 hours and 7 minutes *Mean Time*, and that of Bombay is 11 hours 17 minutes *Civil Time*: the difference between these two is 2 hours 50 minutes (*minus*), and this forms a Constant, which, if applied as follows to the time of high-water at London Bridge for any given day, will give the time of high-water at Bombay: and I may here add that, by personal testing and observation for many years, I have found the results from the foregoing rule to be as correct as could be desired, and I

have also learned from the Dock Master's Department at Bombay, that the time given in the Bombay Calendar or Newspapers is all that they need for docking ships, &c. I find also, that the times of high-water given in the "*Times of India*," agree with my own calculation to a minute for several consecutive days, and at utmost only varying ten minutes, when the sun and moon are approaching conjunction.

My rule is as follows:—The morning or forenoon high tide at Bombay is on the same day (*Civil Time*) as at London Bridge, when the tide table for it, at pages 488 and 489 of the Nautical Almanac, gives the first tide less than 2 hours and 50 minutes, otherwise the previous day's second tide when above 14 hours 50 minutes; in both cases applying the Constants, *minus* 2 hours 50 minutes. Afternoon high-tides at Bombay are on the same day as at London Bridge, when the first tide in its table is above 2*h*. 50*m*., and the second tide less than 14*h*. 50*m*.

Now, an error of ten minutes for the time of high-water is less significant than generally supposed, I mean to say for all *practical* purposes; for instance, we will say that the tide runs for six hours flood, and that the rise and fall is 12 feet, or 2 feet per hour; well, an error of ten minutes would only give two inches error in the height of the tide, and this, for most *nautical* purposes would, in 999 cases out of 1,000, be insignificant and inappreciable. However, I will go further.

Supposing we even have a formula by which we can calculate the time of high-water, or the height of water at any required hour to within ONE minute, as Mr. Burgess appears to think so desirable. What shall we be the gainers? How often are scientific theories exploded and rendered null by the inscrutable ways of Nature, and where is it oftener the case than with the tidal system? An abnormal wind will sometimes effect a tide a whole hour; the swell of the sea, when contrary to the tide, will do the same. Therefore, of what practical use is it to have formulas for predicting tides or the tidal range with greater accuracy, than that suited for practical purposes, when such is the case? Professor Orlebar was no doubt a good mathematician, but he was a landsman, and knew more of tides in theory than practice; but if the law pertaining to tides never varied, he and others could give us the means of predicting them with the utmost accuracy.

There are also one or two other remarks in Mr. Burgess' paper, relative to the Government Observatory, which require passing notice and explanation on my part; for instance, the Government Observatory has for its object more to collect and record data from a continuity of observations, than to undertake the discovery of laws which pertain thereto. With reference to terrestrial magnetism, we record the various changes that occur from hour to hour, so also do we the tidal curve or changes, when the tide gauge is in order; and these, with their simple results, as also those connected with Meteorology, are published annually in the Observatory volume; but we leave it to scientific bodies and persons at home or elsewhere to disentangle the skein of science which we are ordered to procure from actual observation, and from which patient mathematical investigation will no doubt be able to discover the laws by which these branches of science are governed and regulated. This is all that the Observatory has ever done, and all that it has ever been called upon to do, and therefore, whatever persons unacquainted with its duties may expect or demand from it, it would be impossible for us to step out of our long beaten track to oblige every one; for instance, it is not the duty of the Observatory to supply tide-tables for the port. Does the Royal Observatory at Greenwich do so for London? Certainly not. Does the Royal Observatory, the first Astronomical Observatory in the world, compile the Nautical Almanac? Certainly not. This is all done by a Naval Officer expressly appointed and paid to do so, quite distinct and separate from the Royal Observatory; and I have no hesitation in saying, whether for Nautical or the higher branches of Astronomy, or the subject of tides, the Nautical Almanac is the text book of reference throughout the whole world, which enables us to use all that it treats upon, and reduce it to any given meridian on the globe. Therefore the newspapers and publishers of Calendars, Directories, and Almanacs, and the entire public, are independent of Government in all that concerns not only the tides, but I may say the sun, moon, and stars, and all parties make their own private arrangements for what information they require; and I have pleasure in saying, that I have never heard any complaint against the accuracy of the tides or any other information contained in these publications.

I cannot however conclude, without allowing that Mr. Burgess has gone ably and deeply into the subject he has selected for investigation, the result of which I hope will be, to furnish us with a more exact

formula for calculating the time of high-water and hourly changes of the tides at this port, than those commonly used by the navigator, or that given by Professor Orlebar.

Mr. Burgess replied, that he perfectly understood that the business of the Observatory officially was to chronicle the observations; nor did he think he had intentionally given occasion in his paper to Lieutenant Fergusson to suppose that he was so unacquainted with its duties as to expect more. In attributing the formula hitherto employed at Colaba for computing the times of high-water for the Bombay Almanacs to Commander Moutriou, he had apparently been misled by the circumstances, that Commander Moutriou's name alone appears on the title page of the second part of the Observations for 1847, and that no mention is made in the discussion of the tidal observations there collected of Professor Orlebar's name. He was perfectly aware of the method used by seamen for all ports of applying a Constant to the time of high-water at London Bridge, in order to obtain approximately the time at any other port; but Lieutenant Fergusson must be as well aware as he was, that if this method were a correct one, there would be no sufficient cause for continuing the observations at Bombay or anywhere else longer than was necessary for the determination of the time Constant or the "establishment of the Port." But the assumption was erroneous. The tide at London is of a peculiar character, arising from the confluence of two tidal waves passing round the southern and northern extremities of the island, and being of different ages when they arrive at the mouth of the Thames, the London tides are of an unusual character. Again, the age of the tide at London was upwards of two days, so that for Bombay, where the tide cannot be much more than one day old, we ought to subtract a constant quantity, not from the time of the first, but from that of the 2nd or 3rd following tide at London, in order to obtain the time of the local high-water approximately; for it is well known, that the interval between the moon's southing and high-water depends mainly upon the age of the tide. He thought there was cause therefore for instituting the observations and for continuing them, until we had independent means, founded on their results, for determining the tidal phenomena, without reference to the Nautical Almanac method, which was never meant for anything but a rough approximation to serve in want of a better; and in employing the

times predicted in the Bombay Almanac, he had naturally assumed that, as they claimed to issue from the Colaba Observatory, they might be depended upon as the results of the formula: these, and the observations published, were the basis of the deductions of his paper, and he had necessarily assumed that both were to be depended upon. Hence, as both computation and observation related to the actual position of the Observatory, no objections to the position of the tide gauge could affect his results in the least, by which he thought he had shown that the formulæ were insufficient to represent the phenomena.

Mr. Kennelly said, "I have listened to Mr. Burgess' paper with very much interest, for we have a subject again brought before us, which was last presented to the Society, in a valuable and extensive paper by Captain Ross, then its President. Mr. Burgess, in laying down 336 tidal points, both as computed and observed, and in giving us the result on the diagram before the Society, sufficiently proves the zealous labour with which he has prepared his Paper; and I feel confident, now that the subject has been again renewed, that science will be benefited if, in addition to the result which Mr. Burgess has computed from one year's tidal observations, we succeed in gaining that which may be obtained from the sixteen years' observations printed in the Colaba Observatory's Annual Reports. Lieutenant Fergusson, in the remarks which have fallen from him this evening, stated that the formula by which he obtained the time of high-water at Bombay, was by deducting a time constant from the time of high-water at London Bridge, as given in the Nautical Almanac on any day required. I allow, that for practical purposes this plan is found to answer; but I must also state, that empirical and erroneously based, it claims no relation to science, for it has its birth in error. It is already acknowledged, that our computed establishment is far from the truth. How much more must any computation, made on a system of time constant, derived from two distant meridians, complicate and increase that error? Again, it has been said, "supposing we even have a formula by which we can calculate the time of high-water or the height of the water at any required hour to within one minute, as Mr. Burgess appears to think so desirable. What, shall we be the gainers? How often are scientific theories exploded and rendered null by the inscrutable ways of Nature, and where is it oftener the case than with the tidal system? An abnormal wind will sometimes

effect a tide a whole hour; the swell of the sea when contrary to the tide will do the same: therefore, of what practical use is it to have formulas for predicting tides or the tidal range with greater accuracy than that suited for practical purposes when such is the case?" This question is simply answered. We have gained truth, where for years we have been content to remain in error; and if abnormal wind or swell of the sea would seem to detract from this computed system, such would detract much more from a system which had less truth and more error in its composition. I would only further say, that in the year 1842, Dr. Buist, Professor Orlebar, and I think Captain Henry, of the Engineers, were appointed a Committee to erect a tide gauge at the Observatory, but it was not until after three or four years' unsuccessful attempts, that the present tide gauge was erected. The Colaba Land Company promised that, on the completion of their sea wall, they would further assist the object of the Committee, by placing a tide gauge at such a place on their ground as the Committee would point out; but the subject would seem to have been forgotten, and the promise of the Land Company has never been fulfilled. I am of opinion, that a suitable place for the establishment of a tide gauge would be midway up the harbour, and it seems to me there could be no better position than the Government Dockyard, or a place a little north of the Custom House Bunder. I have much pleasure in seconding the vote of thanks proposed to Mr. Burgess by Lieutenant Fergusson."

Captain Barker observed, "that local causes should always be taken into consideration. That for all practical purposes we have found the Tide Tables, as published in the Nautical Almanac of "Time of High-Water at London Bridge" answer very well. The difference between the time of high-water on full and change of the moon at London Bridge, and time of high-water at Bombay Dock gate, we allow to be 9*h*. 10*m*. Say, required the time of high-water at Bombay on 24th January, add 9*h*. 10*m*. to the time of high-water at London Bridge 23rd, 2nd Column. This gives our A. M. tide. 9*h*. 10*m*. being added to the London Bridge of the 1st column of 24th, gives our P. M. tide for that day. I am aware that this is only approximate, but as I said before, we have found it to answer all practical purposes. I suggested that, besides the tide gauge at the Colaba Observatory, we should have a tide gauge at the upper part of

the Harbour, at Butcher's Island (Derdeva) or at Trombay, another at Karanja Island, or on eastern side of the harbour. That the tide should be carefully registered at each of these stations every five minutes (as was done at Kurrachee) for an entire year, and that care should be taken to note the direction and strength of wind, moon's age, and other particulars, passage of the meridian, &c., &c. Were this done, we should have a tide table to which we could with confidence refer, not only for the time of high-water, but also for the rise and fall of tide throughout the year. The south-west monsoon, it is well known, sets in from the southward first, and always commences here with the wind at south: this drives a considerable volume of water into the harbour, particularly when it sets in with the *full moon and perigee*, as was the case at the commencement of last south-west monsoon, when we had a very unusual high tide."

Mr. Burgess thought it would be quite sufficient to carry them on for two lunations or so only; and make the observations every quarter of an hour. No doubt the more observations were made the more accurate the results must be; but one might go to unnecessary excess and expense in such work.

The Rev. Mr. Fletcher observed, that to the north the tide divided into two on the Indian Coast, as well as the London tides.

The Meeting then adjourned to Thursday, February 19th, 1863.

SESSION 1862-63.

Sixth Meeting.—*February 19th*, 1863.

The Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 19th instant, at half-past 4 P.M.

Present.—The Honorable W. E. Frere, C.S., F.R.G.S., *President*, in the chair; Captain W. C. Barker, I.N., *Vice-President*; J. Burgess, Esq., F.E.I.S.; Atmárám Pándúrang, Esq., G.G.M.C.; Ráo Saheb Vishvanáth Náráyan Mandlik; Venáyekráo Jugonnathjee, Esq.; Captain Mohammed bin Hamees, *Members*; and G. C. M. Birdwood, Esq., M.D., *Acting Secretary*.

The minutes of the last meeting were read and confirmed.

Election.—Sorabjee Pestonjee Framjee, Esq.

Donations.—The following donations were laid before the Society, for which their best thanks were directed to be given to the donors:—

1.—Proceedings of the Royal Society, Nos. 47, 48, and 49.—By the Royal Society.

2.—Galvano's Discoveries of the World.—By the Hakluyt Society.

3.—A Catalogue of Atlases, Maps, and Globes.—By Edward Stanford, Esq.

4.—Report on the Cotton Gin Factory in the Dhârwar Collectorate, for the half year ending May 31st, 1862.—By Government.

5.—Catalogue of the Library of the Bombay Branch of the Royal Asiatic Society, corrected up to the 31st December 1862.—By the Society.

6.—Catalogue of the Economic Products of the Presidency of Bombay, by Assistant Surgeon George Birdwood, M.D.—By the Author.

Letter read.—From the Honorable H. L. Anderson, Chief Secretary to Government, Political Department, forwarding the following copy of a letter from the Acting Political Resident at Bushire:—

From Lieutenant Colonel LEWIS PELLY,
Acting Political Resident, Persian Gulf,
To the SECRETARY to GOVERNMENT,
Political Department, Bombay.

SIR,—I report, for the information of Government, that an earthquake occurred at Shiraz on the 21st December 1862. It commenced two hours after sunrise, and lasted at intervals till noon of the next day 22nd, causing much damage. During the disturbance the people fled without the walls of the town.

I have the honour to be, &c.
LEWIS PELLY, Lieutenant Colonel,
Acting Political Resident, Persian Gulf.

Residency, Persian Gulf, Bushire, 13th January 1863.

There being no other business before the meeting, Mr. Burgess was called upon by the Honorable President to read his Paper, "Further Discussion of the Tidal Observations made for Government at the Colaba Observatory in 1861."

Captain Barker observed, that he considered the paper of Mr. Burgess, which had just been read, was on a highly important and interesting subject, but that Mr. Burgess had given him (Captain Barker) credit for what he did not deserve. The system prevailing in the Master Attendant's Office, of ascertaining the time of high-water, was a long-established system, and for all practical purposes was found to answer. Captain Barker however thought, that it was to be regretted that we should have to go so far as London Bridge or Brest to ascertain the time of high-water at Bombay, and that we ought to have data of our own to guide us. This could only be obtained by tidal observations taken at convenient places on the western, northern, and eastern shores of the harbour, the tide being carefully noted every five minutes at each station, and at the same time the direction and strength of the wind; care also being taken that the said tide guages be referred to one well-known standard on shore. The reasons for having these several tide guages are, on account of the difference between the times of high-water at different parts of the harbour, amounting between the western and eastern shores to near three quarters of an hour, and for such frequent observations that we might be able to ascertain the depth of water in any part of the harbour at any time of tide throughout the year. Captain Barker considered that the best thanks of the Society were due to Mr. Burgess for his highly interesting paper.

A very animated discussion followed, and the Honorable Mr. Frere assured the meeting, that Government would attend to the matter. A cordial and unanimous vote of thanks was then awarded to Mr. Burgess for his valuable and interesting paper, and the meeting adjourned to Thursday, March 19th, 1863.

SESSION 1862-63.

Seventh Meeting.—*March 19th*, 1863.

The Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 19th instant, at half-past 4 P. M.

Present.—Captain W. C. Barker, I.N., *Vice-President*, in the Chair; Commodore J. J. Prushard, I.N., *Vice-President*; J. Bur-

gess, Esq., *F.E.I.S.*; Edwin Heycock, Esq.; Commander G. T. Robinson; Commander W. P. Mitcheson; I.N.; Munmohandas Davidas, Esq.; Captain Mohammed bin Hamees, *Members*; and D. J. Kennelly, Esq., *Secretary*.

The Minutes of the last Meeting were read and confirmed.

Election.—Professor F. J. Candy, M.A.

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1.—Bulletin de la Société de Géographie Cinquième Série, Tome IV. By the Geographical Society of Paris.

2.—Jahrbuch der Kaiserlich Königlichen Geologischen Reichsansalt. By the German Geological Society.

Letters read:—

1.—From T. Rice, Esq., forwarding a Bottle Log found a day or two before the 27th of February last, by one Anthony Fernandez of Negombo, near Katty Kadoe. This Bottle traversed a direction of East South East—1180 miles—with a period of 462 days.

2.—From Comte d' Héricourt, Paris, requesting to be furnished with the names of the active members of the Society, such as President, Secretary, Treasurers, &c. as also the publications made in 1862, and forwarding a form and address for the purpose.

3.—From the Royal Geographical Society of London, furnishing a detailed account of the circumstances which contributed to derange the brain of their Chief Clerk Mr. R. J. F. Wheeler, who is now an inmate of a Lunatic Asylum, and forwarding a subscription list in favour of his unfortunate wife and children.

Resolved.—That the papers on behalf of the Wheeler Relief Fund be circulated to the Honorable President and Members of the Bombay Geographical Society.

There being no other business before the Society, conversation on miscellaneous scientific subjects followed, after which the Meeting adjourned to Thursday, April 16th, 1863.

SESSION 1862-63.

ANNUAL MEETING.—*May 21st, 1863.*

THE Annual General Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 21st instant, at half-past 4 P. M.

Present.—The Honorable W. E. Frere, C.S., *F.R.G.S., President*, in the Chair; Bhau Daji, Esq., *G.G.M.C.*; J. Burgess, Esq., *F.E.I.S.*; Commander G. T. Robinson; Sir Jamsetjee Jejeebhoy, Bart., *F.R.G.S.*; Lieut. H. Morland, *F.R.A.S.*; Atmaram Pandurang, Esq., *G.G.M.C.*; and D. J. Kennelly, Esq., *F.R.G.S., Secretary*.

Mr. Kennelly's attendance being urgently required at the Dockyard, owing to official duties, Dr. Bhau Daji was requested to officiate for the Secretary.

The Minutes of the last Meeting were read and confirmed.

Elections.—The following gentlemen having requested admittance, were elected Members under Rule XXII. of the Society:—Cowasjee Jehangirjee Readymoney, Esq.; C. M. Keir, Esq.; R. Knight, Esq.; W. F. Stearns, Esq.; G. W. Terry, Esq.; W. Tracey, Esq.; the Honorable H. Newton, C.S.; the Honorable Rustomjee Jamsetjee Jejeebhoy; H. Miller, Esq., M.D.; Karsandas Madhavadas, Esq.; Hormjee Cursetjee Dady, Esq.; Cowasjee Manickjee, Esq.; and K. R. Cama, Esq.

Donations.—The following donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1.—Proceedings of the Royal Geographical Society of London, Vol. VI., No. 5, and Vol. VII., No. 1. By the Society.

2.—Proceedings and Transactions of the Meteorological Society of Mauritius, Vol. V. By the Society.

3.—Catalogue Raisonné of Rare, Valuable, and Curious Books. By B. Quaritch, Esq.

4.—Report on Project of Reclaiming Land between Bombay and Trombay, by Lieutenant W. M. Ducat. By Government.

5.—Restitution de deux passages du texte Grec de la Géographie de Ptolémée. By Monsieur M. D'Avezac.

Letters read :—

1. From the Honorable H. Hebbert, C.S.; Surgeon F. Broughton, *F.R.C.S.*; F. D. Faithfull, Esq.; the Rev. R. Galbraith, *M.A.*; and Commander R. W. Whish, withdrawing from the Society.

2. From J. R. Arthur, Esq., C.S., Private Secretary to His Excellency the Governor; the Secretary, Bombay Medical and Physical Society; the Principal, Bombay Grant Medical College; the Secretary, Bombay Benevolent Library; the Secretary, Poona General Library; acknowledging with thanks copies of Vol. XVI. of the Society's Transactions.

3. From the Secretary, Washington Observatory, acknowledging with thanks Vols. XV. and XVI. of the Society's Transactions, together with the Catalogue of the Library, and intimating the despatch of the Observatory's publications for the acceptance of this Society.

4. From Prof^et Commandew Christophe Negri, introducing Dr. Orio to the notice of the Society, and requesting them to forward the Doctor's views in the success of his mission.

5. From M. Robertson, Esq., Commanding "Balgonaymth," forwarding diagrams of two Cyclones experienced by him.

6. From Lieutenant Colonel H. Rivers, R. E., Secretary to Government, Public Works Department, forwarding a present to the Society.

7. From C. Meldrum, Esq., Secretary Meteorological Society of Mauritius :—

"OBSERVATORY, MAURITIUS, *6th March* 1863.

SIR,—By to-day's Mail I forward to you, at the request of the Meteorological Society of Mauritius, a copy of the Society's Transactions for 1860, and beg that you will present it to the Bombay Geographical Society.

I had the pleasure the other day of reading a very interesting account of a Cyclone which poured near Bombay on the 22nd November, and was struck with the remark that the Barometer gave no indication of the coming storm. Here the Barometer invariably gives a warning of several days, and distinctly indicates the existence of a revolving storm often when it is 1,000 miles distant. I should be very much obliged to you, or Lieutenant Fergusson, for the readings of the Barometer at the Observatory at 4 A. M., 10 A. M., noon, 4 P. M., and 10 P. M. on the 18th, 19th, 20th, and 21st of November, with the force and direction of the wind at those hours on those days. In the South-east Trade Wind at Mauritius, the Barometer is an unerring guide; and it would be curious to find that the case was different in the North-east Trade Wind.

A good many log-books are copied here; but we have not received any from vessels that experienced the Cyclone in question, otherwise I should be happy to forward the extracts to Lieutenant Fergusson. Strong gales prevailed near the line on the 14th and 15th of November in about 88° East.

I am, Sir,
Your most obedient Servant,
(Signed) C. MELDRUM,
Secretary to the Meteorological Society of Mauritius."

8. From the Honorable H. L. Anderson, C.S., Chief Secretary to Government, forwarding the following copy of a letter from Lieutenant Colonel Lewis Pelly, late Acting British Agent at Zanzibar, containing cursory observations upon the Island of Mahé, the largest of the Seychelle group :—

No. 96 of 1862.

To the SECRETARY TO GOVERNMENT,
Political Department, Bombay.

SIR,—I offer to the Government a few cursory observations upon the Island of Mahé, the largest of the Seychelle group.

There are in all *thirty islands* in this group, varying in size from that of Mahé, which is about seventeen miles long, by from three to four miles broad, down to that of islets containing only a few acres of ground.

The group may be divided into two clusters; one to the westward, round Mahé, and the other to the eastward, round the Island of Praslin, which is next in size to Mahé. The general aspect of both clusters is green and cheerful; but that of Mahé is the loftiest, for the peaks along the backbone of Mahé itself may be nearly two thousand feet above the water line, while Silhouette, a woody, conical isle, lying about seventeen miles to the northward of Mahé, rises into one central peak of from two to three thousand feet in height.

The Seychelle Islands (which derive their name from a former French Minister) are a granite formation, cropping up in the centre of a vast bowl of coral. This bowl may have a diameter of some one hundred and twenty miles: its rim rising nearest to the surface of the water like one of the Atholls described by Mr. Darwin. Approaching the

rim of this coral bowl from any point oceanwards, you strike soundings in from 7 to 8 or 9 fathoms. Here and there, especially on the western quadrant, you come upon three fathom patches. And on the northern, as also I believe on the southern edge, you find low sandy islands, sprinkled with scrubby brushwood, and differing altogether in appearance, as perhaps in structure also, from the Seychelle group proper. Bird Island and St. Abbs are isolated uninhabited spots of the description under notice.

Running towards the centre of the bowl, the soundings deepen to twelve, to twenty, and to thirty-two fathoms, and give the last-named depth nearly up to North Island, which appears like a detached promontory of Silhouette. It seems, indeed, that the Seychelle Islands are the loftiest summits at the axis of a primitive system of submerged mountains, whose lower scarps and intervening slopes and plateaus support the coral growth now sketched.

A steepish woody ridge of hill land runs the length of the island of Mahé; now broken into transverse valleys, and now bright with a plot of green sward; here exposing a granite cliff, and there discovering a torrent-scarred ravine of red earth with overhanging brows of trees. Rain falls frequently, and almost every species of tropical plant seems to flourish; I observed among other vegetation the guava, the Seville orange, the leechee, the breadfruit, the manioc, the sweet potatoe, wild ginger and arrowroot, the cachoonut, cinnamon, cloves, palms of many varieties—for example the sago, the areca, the cocoanut, and the cocode-mer; coffee, vanilla, the tamarind, the mango, rice, pawn sooparee sugar, cotton, nutmeg, mace, the poppoi, also the casuarina, the sirus, the wood known on the island as the nut wood, and which is useful for a broad, long, and durable planking, the fan palm or traveller's friend, and the neem tree. I do not know how many among these specimens may be indigenous; but I am told that some at least of them have been introduced.

The mangoes did not look healthy; cotton and rice, I learned, had been extensively planted during the French occupation of the island, and throve excellently, coffee also is said to yield a good berry. Sugar, of which I visited an abandoned estate of some six hundred acres on the north-west side of the island, does not seem to pay; but whether want of success were attributable to an unsuitable soil and climate, or to want of skill and industry, I could not accurately ascertain. The groves of

cinnamon were dense, large, and luxuriant: but this spice does not pay as an export.

The climate of Mahé is reputed singularly salubrious for an island situate only five degrees from the equator. Fever is almost unknown, and the commonest disease is dysentery. Wood of an excellent and durable quality was formerly abundant on the slopes of the hills; but the supply was recklessly wasted, and is now nearly exhausted. The best wood for building purposes is now brought from Silhouette. Sheep will not thrive at Mahé. But goats it is said do well enough, although I saw very few on the farms. No cattle are bred on the island; nor is beef killed unless when a cruizer may chance to call in. Both sheep and cattle are imported in small numbers from Madagascar. A few ponies also are imported, and I noticed one young camel looking very raw, wet, and unhappy. Roads in a general way there are none, though one leads from Port Victoria straight up across the backbone of the island, but shrinks into a footpath as it descends the western water-shed.

I saw but one specimen of the coco-de-mer; Praslin being the only island where this palm unique it is said in the Seychelles is indigenous or thrives spontaneously. It is called the loftiest and the longest-lived of the palm tribe. When first it appears above ground it throws out one large leaf, and for some years following, throws out annually one leaf more. Then it begins to protrude its endogenous trunk; and when the trunk is well up, the age* of the tree may, it is supposed, be known from the number of rings on its rind, added to the number of leaves on its coronal. The wood, branches, and fruit are very serviceable. The creole girls peel the leaves into thinnest strips, and work these into delicate and beautiful baskets and fans. The shell of the fruit you may find, anon, turned into the schallop of some Fukeer in Northern India. As to the shape of this fruit, Government are aware, it really is very peculiar.

The census, which distinguishes only between the sexes, gives the population of the whole group of the Seychelles at from six to seven thousand human beings. Of these, Mahé may number two thousand, and Praslin five hundred inhabitants. But this estimate is approximate merely. The population of Mahé is principally creoles; these are

* Still, I understand Henslow in his Botany to assert, that it is only in dicotyledons that age can be known, because it is only in exogenous plants that periodical or gradual accretions at the circumference of the stem occur.

reputed indolent and good-natured, addicted to drink, especially rum; of easy morals, and long-lived. Their staple of food is manioc and fish, of which latter article there is abundance, though carelessly sought. They consume also poultry and rice, and occasionally turtle, which are brought from the Amirante Isles, and preserved in salt-water ponds, drained and flooded by the ebb and flow of the tide.

Port Victoria is the chief town of Mahé: a neat township picturesquely dotted among underwood immediately above the line of sea beach and along the lowest swellings of a back ground of hills. It possesses a creditable stone-masonry church, and the Government House peeps out prettily from its English-looking grounds and shrubberies. A clear boulder-strewn stream dashes down between the Commissioner's lawn and the main street of the town. The houses in general are built of wood upon coral foundations, and have the high roofs, gables, and general character of the little chateaus and farmsteads of the fallaise copse of Normandie. Creole French is the language of common life, with manners and customs to match. Here, as everywhere else in the east, orientals adopt French modes more readily than they do those of any other European nation; and you may find a crisp-woolled minx of an African, with thick lips, gesticulating about her civil rights and adjusting her headkerchief, her boddice, and her gaudy skirt, just as though she were a pert little piquante grisette.

Considered as a port, Victoria offers sheltered anchorage during the south-east trade and south-west monsoon; but is open to the force of that from the north-east. Mahé itself protects the harbour to the westward, and a chain of islets to the eastward. The southernmost link of this chain is separated only by a narrow and reef-strewn channel from the main island. However, few square-rigged vessels visit Mahé: occasionally one of the cruizers from the division of the east coast of Africa calls in, and Port Victoria is considered, I believe, as one of the best stations in that division for giving leave to the men. American whalers sometimes put in for water or provisions; but, on the whole, the trade of the island is trifling, and is principally carried on in small schooners running between Mauritius, the Amirante, and Seychelles. These bring supplies and miscellaneous goods from Mauritius, and turtle, which are speared, from the Amirante. They carry back cocoanut. Estates of this nut yield good returns at Seychelles, and I was informed

that the proprietor of the larger portion of Silhouette lives at Mauritius in affluence upon an income drawn from cocoa estates on the islet. When at Zanzibar, Captain Oldfield and I gave some encouragement to an Indian merchant to run a small cargo of rice, coffee, and other provisions to Mahe. The profit on the venture was considerable, although the goods were sold out of hand. And I have no doubt that, on a small scale, a remunerative trade might be driven between Seychelles and the east coast of Africa. The goods from Zanzibar were shipped in a dhow, which ran across in the month of May, and this was, I believe, the first native craft that had ever made the passage.

Politically considered, Seychelles, like the Amirante isles, are a dependency of the Mauritius Government. The subordinate administration of Seychelles is in the hands of a Civil Commissioner, on an income of about £1,000 per annum. The chief judicial functionary is a District Magistrate, who becomes administrator *ad interim* in the absence of a Commissioner. There is also a Medical Officer and an Inspector of Police, with a detachment of some twenty-two constables. The cost of the Seychelle administration I understand to be about £6,000 per annum, against a revenue of from £1,300 to £1,500 per annum, collected on the islands, and derived mainly from an excise on rum, together with a customs receipt of about £100, being an import duty at 6 per cent. *ad valorem*, gathered on the spot. It is asserted, however, that the bulk of the Seychelle revenue should be customs, but that these are principally collected at Mauritius, and appear in the Mauritius returns; since nearly all imports, whether of provisions, miscellaneous goods, and even coolies from India, are passed through the Custom House at Port Louis before being transmitted to Seychelles.

The jurisdiction of the District Magistrate extends to all criminal cases, wheresoever committed on the Seychelle islands. He can imprison for any term, but in cases of murder, he simply institutes preliminary proceedings, and the trial is held at Mauritius, whither witnesses and accused are shipped as opportunity may offer. Complainants, defendants, and parties criminally charged, on whatsoever island, come to Mahe as the court of first instance. The Judge does not go on circuit. Appeal lies to the higher court at Port Louis in cases of imprisonment for more than one year, or of fine above £50. Hard labour on the roads obtains, and is found to work well. The average

number of prisoners in jail at one time may be about fifty.* All civil cases are open to appeal to Mauritius. Landed titles, like other matters on the plea side, are subject to French law—the old Code Napoleon I believe. About twelve judicial transferences of land have been registered in five years: the estates transferred varying in value from 1,000 Dollars up to a maximum of 5,000 Dollars. No land tax is levied; all land being held in fee simple. All correspondence passes through the Commissioner, and is liable to his remarks, as head of the local government.

The old French mark passes as the common small currency of the island. Its value may be about three farthings. The rupee and the dollar, especially the Maria Theresa, or black dollar, (still struck at Vienna from a die preserved for use on the east coast of Africa I believe) are also current.

The inhabitants of Mahé assert, that they suffer from being a dependency of Mauritius. They would prefer that Seychelles should be a separate government, so that their Commissioner might enjoy more real power, especially in financial matters, and for the prosecution of work of public utility. They consider further, that the desired change would preclude references and consequent delays; that justice would be brought to their doors; and that there would be a greater incentive to development of the resources of the islands on the part of the local government. They would like also some degree of Municipal Government to be initiated in the more considerable islands, such as Praslin, so as to save the necessity for reference in minor matters to Mahé. They would wish their coolies to be imported direct from India instead of through Mauritius. Indeed, they complain much of the want of labour, although Captain Oldfield brought them a supply of nearly 400 emancipated slaves from the east coast of Africa. These are now carefully registered, protected, and provided for. I talked with one man, a runaway slave of His Highness Syed Burghesh. The fellow told me his wages were six dollars a month, that he was saving money, and that he intended to return to Africa directly he had made a bag.

Defective titles to some of the estates is another alleged ground of complaint. It appears that, in the first instance, French immigrants set-

* I am not sure but that some of these fifty may have come from Mauritius.

thing on these islands, received grants of lands in allotments of 108 acres each, upon condition of residence and building within a period of one year. These grants were made provisionally at Seychelles, and were afterwards confirmed in perpetuity by the Superior Government at Mauritius. When, however, the English took Seychelles, and which they did some little time before taking Mauritius, they continued to grant provisionally as before; but, of course, no confirmation took place from the Isle of France so long as the latter remained French. Hence the titles of estates granted during that period were unconfirmed at the time, and still so remain. This defect, the Creoles say, should in equity be cured.

Thus much for the little plainings of the good people of Mahé. Others assert, that all their difficulties and their poverty are due to their own want of thrift, industry, and enterprise. One fact is obvious, that nature has given them a delightful island, abundantly watered, well stored with wood, rich in soil, capable of producing the fruits of many climates, and healthful. Where these blessings are freely bestowed, it is difficult to believe that man cannot render life useful, prosperous, and happy, provided only he himself be virtuous, prudent, and persevering.

The Mail steamer to and from Aden and Mauritius calls at Mahé; unless during the months of June, July, and August, when, owing to the force of the south-west monsoon, it avoids the islands on its passage out. It so chanced that, during the week I passed in Port Victoria, waiting on board Her Majesty's Steam-frigate "Orestes" for the Mail, the Seychelles were visited by a violent hurricane, the first ever experienced there. This circular storm strengthening out of the south-east trade, veered southward, westward, and gave us its full fury from north-west. It then moderated northwards, hung awhile at north-east, and finally subsided into the south-east trade again, followed by floods of rain. I do not remember to have ever heard any sound so mournful as the Titanic* sobbings of that hurricane—now hushed an instant, as spent with passion the tempest gasped for breath.

During the storm there were reefs all round us within a few hundred yards, and the shore was not a mile distant; yet we could see neither land, nor reef, nor even sea, but only a scud of foam blown past the side

* "Such mourning and such silence Thea knew
When Saturn reigned no more."

like lace rapidly unrolled. On the storm subsiding, the scene ashore was melancholy indeed. The steeper hill slopes had been washed bodily down into the valleys; in some instances crushing during the night estates, families, and houses in one common grave and ruin. The brook by Government house had burst its banks and poured in a torrent down the main street of the town, hurrying houses, provisions, men, women, and children along its flood towards the sea. Trees were torn up by the roots; the palm tops were twisted off at the neck, as during the cannonade at Mohamera; and the French Religieuse were crushed into the earth as they stood with their priest and their scholars at morning prayer in their hospital." I left one day afterwards; but even then some fifty people were asserted to have been killed or severely maimed, and it was assumed that some fifty more were missing on the one island of Mahé. The little schooners were crunched together and sunk.

I have the honour to be, &c.

LEWIS PELLY,

Late Acting Consul and British Agent at Zanzibar.

(True copy)

H. L. ANDERSON,

Chief Secretary.

9. From the Honorable A. D. Robertson, Secretary to Government, forwarding the following copy of a despatch from the Home Government, with reference to Observation and Collection of Aërolites:—

No. 633.

Extract from the Proceedings of the Government of Bombay in the General Department, dated 25th April 1863.

Read the following papers:—

Despatch from Sir Charles Wood, H. M.'s Principal Secretary of State for India in Council, to His Excellency the Honorable the Governor in Council, Bombay, dated 9th February 1863, *No.* 4.

I forward herewith a copy of a letter from the Trustees of the British Museum, together with its two enclosures, respecting the collection of Aërolites which may be procurable in the British dominions abroad; and I have to request, that you will render any assistance that may be practicable, to enable the Trustees of the Museum to carry out their intentions.

Letter from the Deputy Principal Librarian of the British Museum to the Right Honorable Sir Charles Wood, Bart., G.C.B., M.P., dated 23rd January 1863.

I have the honour to acquaint you, that a representation has been submitted to the Trustees of the British Museum, showing that it would be very desirable, with a view to increase and to render as complete as possible the fine collection of Aërolites now in the Museum, that measures should be taken to obtain for that Institution such Aërolites as may in future come into the hands of, or be procurable, by the public functionaries in the British dominions abroad, and Her Majesty's representatives in foreign countries. With this object, the papers, of which I have the honour to enclose copies, were drawn up, and a large number of them has been forwarded to the Foreign Office, by direction of the Trustees, to be transmitted to the British Ambassadors, Ministers, Consuls, and other official persons in foreign countries. A similar course is about to be taken with regard to the colonies in general.

On the Observation and Collection of Aërolites.
Catalogue of the Collection of Aërolites exhibited in the British Museum.

2. I am directed to state, that in no part of the world of equal extent, have more important or more numerous instances occurred of the fall of Aërolites than in the British possessions in India. The Trustees would therefore request of His Excellency the Governor General, that he will be pleased to take such steps as he shall think fit to secure for the British Museum any Aërolites of importance that may be obtainable in Her Majesty's Dominions in India, and I am to ask the favour of your intervention, in causing an application to the above effect to be forwarded to His Excellency.

On the Observation and Collection of Aërolites.

There are two varieties of Aërolites or Meteorites that have been seen to fall from space. The one consists of stony masses, often containing particles of iron; and of these many have been observed in their fall: the other variety is composed for the most part of iron. The actual fall of iron aërolites has been but rarely witnessed, though many masses of metallic iron have been found on the earth's surface, of the meteoric origin of which there can be no doubt.

It is a matter of great interest and of importance to science, that as many as possible of these bodies should be collected for comparison, and that all the circumstances accompanying their fall be carefully recorded; and persons who, in the event of a "fire ball" being seen, or of a mass having fallen, in their neighbourhood, will carefully collect facts regarding them, may make a very valuable contribution to science.

For this purpose, inquiries should be instituted at once into the circumstances accompanying the fall of any meteoric mass, and into the state of any such mass when it has fallen; and as regards any meteoric appearance in the sky, it will be found advisable, after noting carefully the point in the heavens at which the meteor made its appearance, to give, as accurately as possible (see Note), the direction of its track, and the point at which it disappeared.

Where it is possible, this track should be delineated on a diagram, as explained in the Note.

The points to which especial attention is invited, are enumerated in the following two series of inquiries:—

The first series relates to meteoric phenomena in the heavens, and their association with the fall of aërolitic matter to the earth:—

1.—Note the exact position of the observer, according to latitude and longitude.

2.—Give the hour, day of the month, and year.

3.—Give the apparent size of the luminous ball, as compared with the full moon.

4.—Its shape—whether round, pear-shaped, or otherwise; and if elongated, in what direction.

5.—It is particularly important to note the place where the meteor is first seen (as at A, see Note) like a star, and from which, as it moves, it may appear to be increasing in size.

6.—State the duration of the phenomena; and

7.—Whether the ball again dwindles away to the semblance of a star, and then disappears, or whether it retains to the last its full size, or then, as is often the case, divides into several balls or stars.

8.—Give the colours.

9.—Record any facts that can be gathered concerning detonations or noises accompanying the other phenomena.

10.—Endeavour to collect statements relating to the actual fall to the earth of any solid bodies.

11.—Do they consist of stone or iron, and is there anything peculiar in their structure?

12.—Was the body red-hot or warm, or did it exhibit evidence of having been warm outside and cold within? as, for instance, by being hot at first and intensely cold afterwards?

13.—It is desirable further to notice the depth to which, and the direction in which, the aërolite has penetrated the earth; also to state the nature of the soil, the effect produced on it by the aërolitic mass, and the position in which the aërolite was found to be lying in the ground.

The second series of inquiries has for its object the acquisition of a more precise knowledge regarding the aërolites themselves. For this it is important to preserve and to collect, for the purposes of analysis and of scientific comparison, as many of these bodies as possible; and the following suggestions are offered in the hope of promoting this object:—

1.—Endeavour to get the meteorolites as soon as possible after their fall, to prevent them from being injured, fractured, or wetted.

2.—If not entire, try to procure fragments.

3.—Should persons or museums not be willing to part with them for the British Museum, then procure drawings, photographs, models, or casts, accompanied by an accurate description of their colour, their external lustre, and if broken, the nature of the substance or substances exhibited by the fracture; and especially be careful to describe the form of the aërolitic mass, whether angular or rounded, whether prismatic, or otherwise exhibiting an approximation to any geometrical figure. Also state whether its surface be smooth, or marked by any peculiar kind of roughness, or pitted with hollows.

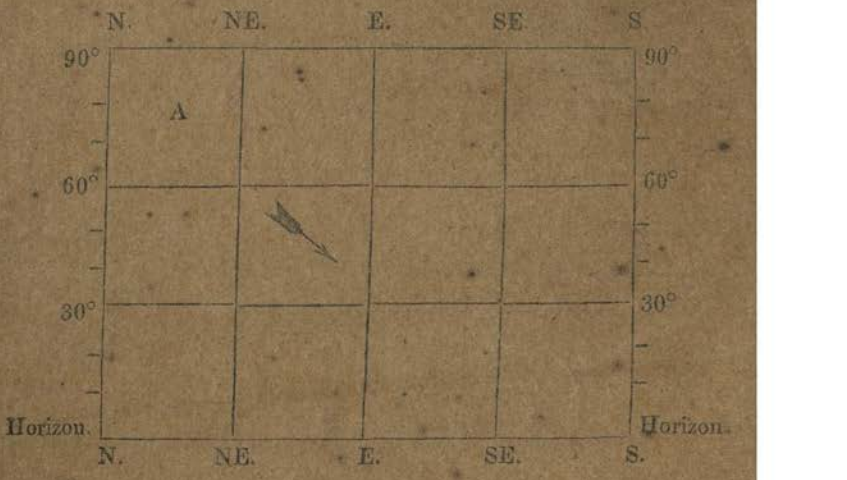
4.—Catalogues of the meteorites in local museums are very desirable, with statements of their weights, and also the time of and other facts accompanying their fall, as detailed above.

5.—From masses of iron or stone still lying on the earth, and too large to be brought away, detach specimens of good size, say from 20 lbs. to 50 lbs. weight, and collect all obtainable information, with detailed descriptions, drawings, measurements, historical accounts, &c.

6.—Iron meteorites should always be cut with a steel saw and emery.

The Collection of Aërolites in the Mineral Department of the British Museum is now, as regards the mass and size of the specimens, the finest in the world, and any person who may be in a position to contribute additional specimens, is requested to accompany them with an attestation as to the weight of the specimen, and facts regarding it such as the senders may be in a position to state on their own authority, or as may have come to them on authority which they have reason to accept as reliable.

NEVIL STORY-MASKELYNE.



NOTE.—The delineation of the track of the meteor on paper is very desirable, as presenting greater accuracy than a merely verbal description. A practical and simple method of doing this, consists in noting down the tracks of meteors or "fire balls" upon a projection, like the diagram, of a hemiorama, taken from the place of the observer, noting the altitudes and the azimuths corresponding to meridians and parallels of latitude. The accompanying sketch expresses that to an observer turned towards the East, the meteor appeared in the NNE. at an elevations of 75° and fell down to the SE., where it disappeared only 10° above the horizon.

Catalogue of the Collection of Aërolites exhibited in the British Museum.

[North Gallery, East end, cases A, B, C, and D.]

Note.—The weights of all specimens that are above ½ lb. avoirdupois are inserted in the Catalogue; the average weight of the remainder is 490 grains.

STONE AËROLITES.

				LBS.	GRS.
1.	November	7, 1492.	Ensisheim, France	1	366
2.	April	11, 1715.	Gartz, Schellin, Prussia.		
3.	June	22, 1723.	Plaskowitz, near Reichstadt, Bohemia.		
4.	July	3, 1753.	Tabor (Plan, Strkow), Bohemia		2526
5.	September	7, 1753.	Liponas, Ain, France.		
6.	September	13, 1768.	Lucé en Maine, Dép. de Sarth, France.		
7.	November	20, 1768.	Mauerkirchen, Austria		4950
8.	February	19, 1785.	Eichstadt, Bavaria.		
9.	October	13, 1787.	Charkow (Bobrik), Russia	1	599
10.	July	24, 1790.	a. Barbotan, Dép. des Landes, France		2750
			b. Roquefort do. do.		
11.	June	16, 1794.	Siena, Tuscany		1720
12.	December	13, 1795.	Wold Cottage, Yorkshire.	47	4056
13.	March	8, 1798.	Sales, Villefranche Dép. du Rhône, France		2953
14.	December	13, 1798.	Krakhut, Benares, India.		3362
15.	April	8, 1803.	L'Aigle, Dép de l'Orne, France	2	1710
16.	April	5, 1804.	High Possil, Glasgow, Scotland.		
17.	March	14, 1806.	Alais, Dép. du Gard, France.		
18.	March	13, 1807.	Timochin, Smolensk, Russia.		
19.	December	14, 1807.	Weston, Connecticut, U.S.		
20.	April	19, 1808.	Casignano, near Borgo St. Donino, Parma.		

				LBS.	GRS.
21.	May	22, 1808.	a. Stannern, Moravia	1	3074
			b. Langenpiernitz, Moravia.		
22.	September	3, 1808.	Lissa, Bohemia.		
23.		1808.	Moradabad, Bengal, India.		
24.	August	1810.	Mooresfort, Tipperary, Ireland		3003
25.	November	23, 1810.	Charsonville, Dép. du Loiret, France.		
26.	March	12, 1811.	Kulesch[illegible]ka, Poltawa, Russia.		
27.	July	8, 1811.	Berlanguillas, near Burgos, Spain.		
28.	April	10, 1812.	Grenade, Toulouse, France.		
29.	April	15, 1812.	Erxleben, between Magdeburg and Helmstadt, Prussia.		
30.	August	5, 1812.	Chantonnay, Vendée, France	1	2045
31.	September	10, 1813.	Adare, Limerick Co., Ireland.		
32.	December	13, 1813.	Lontalax, Wiburg, Finland.		
33.	September	5, 1814.	Agen, Dép. Lot et Garonne, France.		
34.	February	18, 1815.	Durala, Territory of the Patyala Raja, India. .	29	
35.	October	3, 1815.	Chassigny, near Langres, France.		
36.	April	10, 1818.	Zaborzika, Volhynia, Russia.		
37.	June	1818.	Seres, Macedonia, Turkey.		
38.	June	13, 1819.	Jonzac, Charente, France.		
39.	October	13, 1819.	Politz, Gera.		

				LBS.	GRS.
40.	July	12,	1820. Lixna, Dunaburg, Witebsk, Russia.		
41.	June	15,	1824. Juvenas, Ardèche, France	1	688
42.	November	30,	1822. a. Futtehpore, Allahabad, India	5	3880
			b. Bittoor and Shahpore, 75 miles NW. of Allahabad		2112
43.	October	14,	1824. Zebrak, near Horzowitz, Bohemia.		
44.	February	10,	1825. Nanjemoy, Maryland, U.S.		4483
45.	September	14,	1825. Honolulu, Owhyhee, Sandwich Islands.		
46.	May	19,	1826. Jekaterinoslaw, Russia ..		2733
47.	February	16,	1827. Mhow, Ghazeepore, India		2359
48.	May	9,	1827. Drake's Creek, Nashville, Tennessee, U.S.		
49.	June	4,	1828. Richmond, Virginia, U.S.		
50.	May	8,	1829. Forsyth, Georgia, U.S.		
51.	July	18,	1831. Vouillé, near Poictiers, France.		
52.			1832-3. Umballa, India.		
53.	June	12,	1834. Charwallas, near Hissar, India.		
54.	August	4,	1835. Aldsworth, near Cirencester, Gloucestershire ..	1	2241
55.	April	18,	1838. Akburpore, Saharanpore, India	3	6011
56.	June	6,	1838. Chandakapoor Berar, India	1	1040
57.	October	13,	1838. Cold Bokkeveldt, Cape of Good Hope	2	3718
58.	February	13,	1839. Little Piney, Pulaski Co., Missouri, U.S.		

				LBS.	GRS.
59.	July	17,	1840. Cercseto, Casale, Piedmont.		
60.	June	12,	1840. Uden, North Brabant.		
61.	March	22,	1841. Grunberg, Heinrichsau, Prussian Silesia.		
62.	June	12,	1841. Château Renard, Dép. du Loiret, France	9	
63.	March	25,	1843. Bishopville, S. Carolina, U.S.....	1	1191
64.	June	2,	1843. Utrecht, Holland.		
65.	July	26,	1843. Manegaon, Khandeish, India.		
66.	April	29,	1844. Killeter, County Tyrone, Ireland.		
67.	May	8,	1846. Macerata, Monte Milone, Ancona.		
68.	Found		1846. Assam, India	1	901
69.	February	25,	1847. Linn Co., Jowa, U.S...	2	1474
70.	July	4,	1848. Marmande, Dép. Lot et Garonne, France.		
71.	October	31,	1849. Cabarras Co., N. Carolina, U.S.		
72.	December	27,	1848. Schie, Dahlsplads, Aggerhuusian, Norway.		
73.	November	30,	1850. Shalka, West Burdwan, India	6	3529
74.	April	17,	1851. Gutersloh, Westphalia.		1804
75.	November	5,	1851. Nulles, Barcelona.		
76.	January	23,	1852. Nellore, Madras, India ..	30	
77.	September	4,	1852. Mezo-Madaras, Transylvania	1	3062
78.	March	6,	1853. Seegowlee, India.		
79.	February	10,	1853. Girgenti, Sicily.		
80.	May	13,	1855. Guarrenburg Bremervörde, Hanover	1	5687
81.	May	13,	1855. Island of Oesel, Balcit Sea.		

				LBS.	GRS.
82.	August	5, 1855.	Petersburg, Lincoln Co., Tennessee, U.S.		
83.	November	12, 1856.	Trenzano, Brescia, Lombardy.		
84.	February	28, 1857.	Parnallee, Madras, India.	130	
85.	April	1, 1857.	Heredia, San José, Costa Rica.		
86.	April	15, 1857.	Kaba, near Debreczin, Hungary.		
87.	October	1, 1857.	Commune des Ormes, France.		
88.	December	27, 1857.	Pegu (Quenggouk), India.	3	4280
89.	December	9, 1858,a.	Ausson, Montrejean, France.....		5250
		b.	Clarac do. do...		1912
90.	February	2, 1860.	St. Julien, Alessandria, Piedmont.		
91.	March	28, 1860.	Kheragur, Agra, India.		
92.	May	1, 1860.	New Concord, Muskingum Co., Ohio, U.S...	17	3389
93.	July	14, 1860.	Dhurmsala, India.....	28	5250
94.	May	12, 1861.a.	Peprassee, India	5	
		b.	Bullooah, do.....		2400
		c.	Nimbhooah (40 miles from Goruckpore).		

IRON AËROLITES.

1.	Fell May	26, 1751.	Agram (Hraschina), Croatia		4395
2.	Found	1751.	Steinbach, Saxony		2011
3.	,,	1763.	Senegal, Africa.		
4.	,,	1776.	Krasnojarsk, Siberia (the Pallas Iron). ...	7	794
5.	,,	1784.a.	Toluca, Mexico	3	3500
		b.	Ixtlahuaca, Mexico	2	1913
		c.	Ziquipilco, Mexico.		

				Lbs.	Grs.
6.	Found	1788.	Tucuman, Otumpa, S. America	1400	
7.	„	1792.	Zacatecas, Mexico	5	4705
8.	„	1801.	Cape of Good Hope, Africa.		
9.	„	1810.	Rasgatá, New Granada.		
10.	„	1810.	Tocavita, Santa Rosa, New Granada.		
11.	„	1811.	Elbogen, Bohemia.		
12.	„	1811.	Durango, Mexico		6562
13.	„	1814.	Bitburg, Eifel, Prussia	2	6124
14.	„	1814.	Red River, Texas, U.S.	1	2625
15.	„	1615.	Lenarto, Hungary	3	3213
16.	„	1816.	Bahia (Bemdegó), Brazil.	5	2658
17.	„	1818.	Lockport, New York, U.S.	11	5125
18.	„	1819.	Baffin's Bay, Greenland		
19.	„	1819.	Burlington, Otsego Co., New York, U.S		1775
20.	„	1820.	Guildford Co., N. Carolina, U.S.		
21.	„	1822.	Minsk, Brahin, Russia		
22.	„	1827.	Atacama, Bolivia	22	
23.	„	1828.	Caille, ~~Dép.~~ du Var France.		
24.	„	1834.	Claiborne Co., Alabama, U.S.	49	
25.	Fell July 30,	1835.	Dickson Co., Tennessee, U.S.		
26.	Found	1835.	Black Mountain, Buncombe Co., N. Carolina, U.S.		
27.	„	1836?	Fish River, S. Africa.		
28.	„	1839.	Ashville, Buncombe Co., N. Carolina U.S.		
29.	„	1839.	Putnam Co., Georgia, U.S.		1745
30.	„	1840.a.	Cocke Co., Tennessee, U.S	60	
		b.	Sivier Co., do.	55	
31.	„	1840.	Hemalga, Tarapaca, Peru.	2	5687
32.	„	1841.	Newberry (Lexington), Ruff's Mtn., S. Carolina, U.S.		4269

				LBS.	GRS.
33.	Found	1842.	Babb's Mill, Green Co., Tennessee, U.S.....	4	425.
34.	„	1844.	Arva (Szlanicza), Hungary	14	
35.	„	1845.	Otsego, New York, U.S.		
36.	„	1846.	Jackson Co., Tennessee, U.S.		
37.	„	1846.	Carthage, Smith Co., Tennessee, U.S.....	54	
38.	„	1847.	Seelaesgen, Brandenburg, Prussia.....	17	5250
39.	Fell July 14,	1847.	Braunau, Bohemia.....	1	2167
40.	Found	1847.	Chesterville, S. Carolina, U.S.....	4	4831
41.	„	1846.	Tula, Russia	1	3323
42.	„	1846.	Smithlands, Livingston Co., Kentucky, U.S.	5	4452
43.	„	1847.	Murfreesboro', Rutherford Co., Tennessee, U.S...	6	1010
44.	„	1850.	Schwetz, Prussia.....	2	2187
45.	„	1850.	Salt River, Kentucky, U.S.		
46.	„	1850.	Seneca River, Cayuga Co., New York, U.S.		
47.	„	1853.	Lion River, Namaqualand, S. Africa.....		6014
48.	„	1854.	Tucson, Sonora, Mexico.		
49	„	1854.	Guyaquila, Sta. Rosas, New Mexico.		
50.	„	1854.	Madoc, Upper Canada..		3170
51.	„	1854.	Tazewell, Claiborne Co., Tennessee, U.S.....		5176
52.	„	1854.	Union Co., Georgia, U.S.		
53.	„	1854.	Orange River, S. Africa.		
54.	„	1854.	Sarepta, Kirghese Steppes, Siberia.....		3500
55.	„	1856-60.	Nelson Co., Kentucky, U.S.		3706
56.	„	„	Jewel Hill, Madison Co., N. Carolina, U.S.		
57.	„	„	Marshall Co., Kentucky, U.S.		

58.	Found	1856-60.	Nebraska Territory, Missouri, U.S.
59.	„	„	Robertson Co., Tennessee, U.S.
60.	„	„	Lagrange, Oldham Co., Kentucky, U.S.
61.	„	„ ?	Leadhills, Scotland.
62.	„	„ ?	Mezövásarkely, Transylvania.
63.	„	„ ?	Kamtschatka.
64.	„	„ ?	S. Africa.

Resolution.—Copy of this Despatch should be forwarded to all Collectors and Political Officers under the Bombay Government, and they should be requested to give such assistance as may be in their power to carry out the wishes of the Trustees of the British Museum.

Copy of these papers should also be placed on the Editor's Table, and be sent to the Bombay Branch of the Royal Asiatic Society, and the Geographical Society.

Ordered, that copies of the above be forwarded to all the Collectors and Political Officers, to the Bombay Branch of the Royal Asiatic Society, and to the Bombay Geographical Society.

A. D. Robertson,
Secretary to Government.

10.—From Lieutenant Colonel W. F. Marriott, Secretary to Government, transmitting the following copies of papers containing geographical information respecting the coast of Mekran :—

Extract from a letter from Lieutenant A. W. Chitty, I. N., dated 4th February 1863, *reporting the result of his examination of the bank of soundings between Guadur and Cape Jask.*

The bank of soundings varies from 5 to 20 miles in distance from the shore, and terminates abruptly, except in the height formed by Ras Mandanny and Ras Zequi, where the depth increases gradually from 15 and 20 fathoms 4 miles off shore to 200 fathoms at a distance of 18 miles.

The land-marks, some of which are conspicuous, will be found a sufficient guide to determine the longitudinal position of a vessel running along the coast, but as some of the capes are of small elevation, and change very much in appearance on different bearings, making it difficult to distinguish them from other points of land, when viewed at

a distance from the shore, great caution will be necessary in adopting them as cross bearings for latitude.

Prior to laying down the cable, I am of opinion, that it will be found necessary to ensure keeping in an even depth of water, and to avoid encroaching on the edge of the bank, which in many places is very steep, to have boats at anchor at the following stations as leading marks :—

1. On the Gwetter bank, which is a perfect flat, having 12 and 14 fathoms on it, at a distance where bearings of the land cannot be depended upon for position.

2. In Longitude 60° 55′ E. (by the Chart) where the bank will be found of very small extent, and from whence there are no conspicuous land-marks to guide a vessel on any particular line.

3. Off Ras Goddeim, where a bank extends 6½ miles from the shore, having 13 fathoms on its edge and 120 fathoms 4 miles further to seaward.

4. Off Khore Tank. The water deepens here from 42 fathoms 3½ miles from the shore (a low cape) to 134 fathoms 3 miles further south.

5. Off Ras Mandiamiy. Shoal water extends to some distance off this cape, there is 40 fathoms 6½ miles off shore, and 200 fathoms 3 miles further off.

6. Off Ras Zeqni. The coast about this cape is very low and deceptive in appearance, and there are no land-marks to determine a vessel's distance from the shore, neither is the cape itself (a low sand point) to be distinguished, until to the north-westward of it.

7. Off Cape Jask. The water deepens rapidly off this cape from 21 fathoms 2½ miles from the point to 93 fathoms one mile further out. From 140 fathoms 4½ miles from the Cape, the soundings are regular to 260 fathoms 12 miles from the shore. Indeed, the whole line (250 miles) might be thus marked at very small expense, by employing fishing boats from the different villages on the coast for the few days, they would be required while the cable is being laid down. I need scarcely observe, that there is some difficulty following closely any particular line on a coast subject to currents setting either to the east or west, according to the prevailing wind: during calm weather I experienced a slight set to the eastward.

I observe some difference in the soundings on the chart made by me in 1861 and those shown in the one now forwarded, which may be accounted for by the rapid change in the depth near the edge of the bank, the former soundings having been taken during a run along the coast, and their position determined approximately as opportunities offered of obtaining observations or cross bearings of the land.

The soundings on the present occasion have been obtained by making a close traverse course from shallow water in shore, to a second deep cast off the bank to seaward, the distance being measured by Massey's Patent Logs (corrected for error), and corroborated at every opportunity both by cross bearings and astronomical observations.

The four self-registering deep sea Thermometers supplied having proved faulty, I have been unable to obtain further temperatures than those contained in the following table, which were taken in April 1861. The surface temperature has been uniform at 69°, and 72° or 3° below what it was in April.

Table of Temperatures.

Fathoms.	Surface.		Fathoms.	Surface.		Fathoms	Surface	
21	73	70½	143	76	70	450	74	53½
32	73	71	150	74	67	450	60	52
40	74	72	185	73	61	476	74	52
42	74	70	255	72	57	630	74	50
64	74	69	260	71	58	750	74	46½
112	72½	61	360	70	54	800	76	46
125	79	67	420	76	52½			
135	77	65	450	74	53			

Extracts from a report by Lieutenant A. W. Stiffe, Indian Navy, on the line of Telegraph from Ras Jaskh to Basrah.

Jaskh to Masendom.

Nature of Bottom.—The bottom continues the same soft green mud, till 14 miles from the entrance of Ghubbet Ghazireh, when it becomes hard and somewhat uneven. The water however is deep, and the tidal current weak, so that I do not apprehend any bad effect.

Tides.—The tides off Ras-al-kuh and the inlet were observed at conjunction (the moon being in perigee), and off the former place found not to exceed 1½ knots, and off the latter only 1 knot, being much less than I had anticipated; the rise and fall by the tide gauge in Ghubbet Ghazireh was 10 feet; high water at full and change 9*h.* 30*m.*

Inhabitants.—The little fishing villages in the inlet, and that on the opposite side, are inhabited by a very harmless race of Arabs, who are exceedingly poor.

Line from Al Haneh to the Isthmus.

Supplies.—Khasab has plenty of good water, owing to its situation at the mouth of the largest valley in the Ruweis-al-Jebal; there is a very extensive date grove, some vegetables are grown, also corn, &c. If there were a demand, any quantity could be raised; sheep and cattle are procurable. I do not in the least doubt that the question of supplies will offer no difficulty. There are plenty of men, as at Basiduh and other places, accustomed to supplying the English, who would establish themselves at Khasab at once.

Ras Mutaf.

Tides.—The tides near the Tumb Island are very strong, running upwards of 2 knots per hour about E. by N. and W. by S. or nearly in the direction of the cable. Just outside Ras-as-Sheikh, the strength was found to be 2 knots, SW. by S. and NE. by N., and as this is across the direction of the cable, and the bottom sandy or gravelly, it may be considered the greatest difficulty, in the way of tides, the cable will meet with; this moderate tide would, I apprehend, not affect the cable (see report on the tide meter supplied to the expedition).

After passing Frur the tides become weaker, and off Kais are under 1 knot per hour, and no greater velocity than this is met with until the river is approached.

Ras Rishir.

Tides.—The tides are weak, setting up and down the coast, maximum certainly under 1 mile per hour.

Meteorological Register kept on Board the Chartered Steamer H. M.'s Indian Navy, commencing 13th De-

December 1862, Chartered Steamer "Johnston Castle," Bombay

Days.		Winds.		Weather. State.	Weather. Clouds.	Aneroid Barometer. Barr.	Aneroid Barometer. Thr.
Sat. 13th	A.M.	NE	3	b m	.. ..	....	..
		NW					
		NE					
	P.M.		4 6	b v	.. ..	....	..
Sun. 14th	A.M.	NE	3 to 4	....	.. ..	....	..
	P.M.	"					
Mon. 15th	4 A.M.	NE	3	b v	.. ..	....	..
	10	NNE	3	b v	.. ..	....	..
	4	"	2 to 3	b c v	1 cirri str.	29·75	76½
	9 P.M.	"	3	b v	.. ..	·82	76
Tues. 16th	4½ A.M.	NNE	3	b v	.. ..	29·80	75
	10	"	2 to 3	b v	.. ..	·91	75
	4	"	"	b v	.. ..	·84	76
	9 P.M.	"	2	b v	.. ..	·91	75
Wed. 17th	4 A.M.	NNE	2	b v	.. ..	29·87	74
	10	NE	1 to 2	b v	.. ..	·95	73

"*Johnston Castle*," *in charge of Lieutenant* A. W. STIFFE, *cember* 1862 *and ending* 31*st January* 1863.

to Muskat and Jashk.—Lieutenant A. W. STIFFE, *Indian Navy*.

Temperature.									Remarks, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry.	Wet.			Surf.	10	90	30	
..	..	..	..	..	..	..	..	....	Deserted Rajam Said, Sukany. 4*h*. 30*m*.—Weighed and stood out of the harbour, a pilot in charge, discharged him near the Inner Light. 5*h*. 25*m*.—Lighthouse NE by N 3½ stood to WNW.
..	..	..	..	..	..	..	..	....	Strong breeze and heavy sea.
..	..	..	..	..	..	..	..	....	Noon.—Lat. 19° 42′, Long. 69° 44′. Decreasing sea and breeze.
..	..	..	..	..	..	..	..	....	Daylight.—Fine weather; passed several bugalahs.
..	..	..	..	..	..	..	..	....	Noon.—Lat. 21° 8½′, Long. 66° 35′.
76½	77	70	77	..	..	..	..	.....	8*h*.—On hauling in the log line, found the Pat. log gone, supposed to have been taken off by a fish.
75	77	69	..	..	..	..	..	....	
75	75	65	75	..	77	..	..	....	NE. swell.
77	77	64½	..	..	..	..	..	....	Noon.—Lat. 21° 56′, Long. 62° 51′ E. 6*h*.—Half speed for the night.
76	77½	67½	79	86	77½	..	..	....	Water smooth. Lost overboard 1 Thermometer.
75	76	65	..	..	..	..	..	....	
73	75	65	71	..	76	..	..	....	6*h*. 20*m*.—Lat. Polaris 22° 26½, Long. Arcturus 60° 44′; steering W ¼ N for the Challenger Bank 8*h*.— $\frac{0}{75}$.—9*h*. Sighted Jebel Jaalan and other high land. 11*h*. 30*m*.—Stood E ¼ N.
74	76½	67	..	..	..	..	..	....	Noon.—Lat. 22° 25′, Long. 60° 14½′ at 1*h*. had $\frac{0}{110}$; at 1*h*. 40*m*. $\frac{0}{110}$; at 2*h*. 20*m*. $\frac{0}{110}$; at 3*h*. 15*m*. stood to W ½ N. Sunset T. B. Jaalan W 15° 5′ S. Safúnát N Pt. W 5° 230′ S.

December 1862, *Chartered Steamer "Johnston Castle," Bombay to*

Date.		Winds.		Weather. State.	Weather. Clouds.	Aneroid Barometer. Barr.	Aneroid Barometer. Thr.
Wed. 17th	4	NNE	2	b v	.....	·86	78
	9½	North	2	b v	.....	·90	74
Thurs. 18th.	4 A. M.	NNE	2 to 1	b v	.....	29·83	73
	10	NW	2 to 3	b v	.....	·92	75
	4	N by W	1 to 2	b v	.....	·92	77½
	9½ P. M.	Calm	0	b	.....	·85	70
Fri. 19th	4 A. M.	Lt. air	0 to 1	b	.....	29·90	73
	10	,,	.....	b v	.....	.....	.....
	4	Northerly	1	b v	.....	·79	78½
	9½ P. M.	,,	0 to 1	b v	.....	·82	75
Sat. 20th	4½ A. M.	Calm	0	b v	.....	29·78	70
	10	Lt. air	0 to 1	b v	.....	·89	72
	4	NE	1 to 2	b v	.....	·82	76½
	10 P.M.	Northerly	1	b v	.....	·88	75

Muskat and Jashk.—Lieutenant A. W. STIFFE, *Indian Navy.*

Temperature.									Remarks, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry.	Wet.			Surf.	10	20	30	
77	77½	68½	77½	90	76	..	..	....	6*h*.—Sights. Lat. Polaris 22° 28′ Long. Aldebaran 60° 21′. Crew sounding.
73½	74½	65	..	..	..	..	..	....	Light S Easterly swell.
73½	73	65	72½	..	76	..	..	....	6*h*. 10*m*.—Ras Kheiran NW by W, gap SW by W ½ W. 9*h*. 30*m*.—Muskat Island NW by W.
76	76½	66½	..	..	..	..	..	....	11*h*. 40*m*.—Anchored in Muskat Cove in 9½ fathoms.
79½	70	..	80	..	..	..	..	....	
91½	72½	67	..	..	..	..	..	....	
72½	72½	69	69	..	..	..	..	....	
..	..	..	..	..	..	..	..	....	
79	79½	71	82	..	..	..	..	....	Noon.—Waited on H. H. the Sultan.
71	72½	66	..	..	..	..	..	....	
68½	70	61	66½	..	..	..	..	....	Received the Sultan's letters and the Resident's instructions. 1*h*. 15*m*.—Received a mail for Bushehr. Preparing for sea.
79	70	67	..	..	..	..	..	....	2*h*.—Stood out of the Cove to N by W ½ W; water smooth.
76	75½	70	76	84	76½	..	..	....	⊙ Laddle. S 16 E.
74	74½	69½	..	..	..	..	..	....	Sea smooth and highly luminous.

December 1862, Chartered Steamer "Johnston Castle," Jask to Ras-

Date.		Winds.		Weather. State.		Weather. Clouds.	Aneroid Barometer Barr.	Aneroid Barometer Thr.
Perl	4 A. M.	Calm	0	b	..	.....	29·85	73
Sun. 21st..	10	Lt. Easterly	0 to 1	b v c	½	to Westward	·94	77
	4	NW	1	b v	..	.....	·86	77
	9 P. M.	Lt. ,,	1 2	b v	..	.....	·86	74
Mon. 22nd.	3¼ A. M.	North	3 to 4	b w	..	.....	29·80	71
	10	Northerly	1	b v	..	.....	29·84	74
	4	Calm	0	b c v	½	cum. over the hills	·78	77
	9 P. M.	,,	0 to 1	.....	..	.....	·78	75
Tues. 23rd.	4 A. M.	WNW	2 to 3	b v c	½	cum.	29·74	74
	10	,,	1 to 2	b v c v	..	.....	·00	..

al-Kuh and Musendom.—Lieutenant A. W. STIFFE, *Indian Navy.*

TEMPERATURE.									REMARKS, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea Water.				
	Dry.	Wet.			Surf.	20	30	Bottom.	
74	74	66	75	..	..	..	..	..	⊙ Jashk Quoin N 19° 55′ W. 8*h.* 15*m.*—*Fixed in 6 fathoms close to Jashk* Point, and stood South into 50 fathoms. Bottle No. 1, and temperature at that depth.
					75½	..	..	77	9*h.* to 1*h.*—Searched for and found a 3 fathom shoal, reported by Lieutenant Mason, I.N., WSW off Jaskh. 3*h.* 30*m.*—In 53½ fathom gr. mud : tried temp. at bottom.
75	74½	68	..	..	..	..	..	..	
					77	..	..	75	Sunset Kuhi Mubarak N 5° 38′ W. 6*h.* 22*m.*—Anchored in 18 fathoms off Ras-al-Kuh. Temp. bottom tried. Trying currents or tide in various ways : flood 7½ furlongs per hour setting NW.
79	78	70½	83	..	..	..	..	77	
					76	..	..	74	11*h.*—Ship swung gradually, but stream weak and setting south.
73	74	69½	..	..	..	..	..	77	
72	72½	66½	..	..	..	..	..	..	3*h.*—Slight southerly set. 4½*h.* Tide made to NW. Tried current log at 17 fathoms, velocity 1½ knots. 7*h.* 12*m.*—Weighed and stood W by N ¾ N. Bearings at sunrise Kurye, N 2° 2′ W Ras-al-Kuh, 33° 38′ W.
78	77	68	70	..	77½	..	..	75	Noon.—52½ fathoms tried temp. of bottom
80½	81	70½	82	..	77	..	76½	77	2*h.* 45*m.*—Anchored in 40 fathoms rock with shells and sand over it off the entrance of Ghubbet Ghazireh to try the tide.
76	75	68½	..	..	..	..	..	..	⊙ Took angles to fix the ship. Made observations on the strength of the tide.
74	74½	66	72½	..	..	..	..	..	⊙ Ummal Fiejarin N 23° 58′ E. 7*h.* 15*m.*—Weighed and stood into Ghubbet Ghazireh. 9*h.* 25*m.*—Anchored in 20 fathoms at the head of the inlet.
..	..	..	..	..	..	..	..	..	Landed to inspect the landing place or the cable and to look for a site for station. Took Theodolite angles on a peak overlooking both coves. 11*h.* 30*m.*—Erected a Tide gauge, pulled round the shore to see the different bays.

December 1862, *Chartered Steamer "Johnston Castle," Jask to Ras-*

Dates.		Winds.		Weather. States.		Clouds.	Aneroid Barometer. Barr.	Thr
Tues. 23rd.	4 P. M.	WNW	3	b c	..	.....	·74	77
	8½	,,	2	b c	..	.....	·93	74
							29·84	74
Wed 24th..	4¼ A. M.	Calm	0	b c w to Nd.	⅜	cirri str. and cum.	·78	..
		NNW	4 to 5	c o u p				
	10	WSW	6	o u p	⅛	cirri str. & nimb.	·83	72
			4					
	4	NE by N	2	b c v	⅛	cirri stv. bank to Northward	·80	70½
	9 P. M.	NNE	2 to 5	b c v	2	cum. str. to Nd.	·85	69
Thurs. 25th.	4 A. M.	Lt. air	0 to 1	b v c	⅛	cirri.	29·80	68
	10	West	1 to 2	b v c	..	a few cirri.	·90	69
		Vble.						
	5	Westly.	1 to 2	b	..	.....	·85	72
	9 P. M	Calm	0	b	..	.....	·89	70½
Fri. 26th...	4 A. M.	Calm	0	b v	..	.....	29·89	68
	10	,,	0	b v.	..	.....	·96	71
	4	Lt. Westly.	1 to 2	b v	..	.....	·89	74
	9 P. M.	Lt. air	1	b v. w	..	.....	·95	72
Sat. 27th ..	5 A. M	Lt. Ely. air	1	b c w v	..	few cirri sta.	29·95	69
	10	,,	to 2	....	..	.....	30·00	71½
	4	,,	to 1	....	..	.....	29·94	80
	9 P. M.	,,	0 to 1	....	..	.....	·95	77

el-Kuh and Musendom.—Lieutenant A. W. Stiffe, *Indian Navy.*

Temperature.									Remarks, &c.
Air.	Wet Bulb. Dry.	Wet.	Max. & Min.	Sun.	Sea Water. Surf.	20	30	Bottom.	
78	79	65½	80	..	..	..	..	....	Received a visit from the Chief of Habalein.
73	74	66½	..	..		..	..	....	Low water at 5*h.* 30*m.*, high water at 11*h.* 30*m.* P. M. Rise and fall 10 feet.
68½	69½	62½	67	..	..	..	..	....	2*h.*—Squall from northward with a little rain, thunder, and vivid lightning. Threatening appearance to northward. 7*h.* 30*m.*—Weighed and steamed round the cove and into Hainalein village; there stood out of the cove and close along the headland, passing inside Umm Fiejarin. 11*h.* 45*m.* Passed through Bab Musendom.
71½	71½	64½	..	..	..	..	..	....	
70	70	63	70	..	74	..	74	73 74	Fresh shemal: afterwards decreasing. Passed close past Mishkan and perforated rocks. 2*h.* 30*m.*—Anchored to NNE off Ras as Sheikh to try the tide, &c. in 30 fathoms sand and shells. Sent the Cutter on shore with the Sultan's letter.
67½	67	63½	..	..	..	..	..	....	⊙ Tomb on point S, 22° 47, W about 1½ distant, confused swell from WSW. Slack water at 11*h.* P. M. and 4½ tide 2 to 2¾.
66½	66	61	66	..	..	..	..	....	Water smooth. Daylight.—Weighed and stood into Khoras Shem, sounding. Picked up the Cutter.
72	72½	64½	..	..	..	..	..	....	8*h.*—Anchored in the Inlet in 15 fathoms mud. Erected a tide gauge; ascended a high peak for angles.
68	68	..	73	..	..	..	..	....	Measured a base near Shem village, and took angles.
69	69½	64½	..	..	..	..	..	....	
67	68½	62	67	..	..	..	..	....	Took Theodolite angles on two peaks.
74	77	68½	..	..	..	..	..	....	Noon.—Closed the tidal observations.
76	76	65½	85	..	..	..	..	....	4*h.*—Started for Seibi in the Cutter.
71	72	66	..	..	..	..	..	....	6*h.*—Arrived at Seibi; saw the wells, and had an interview with the Sheikh.
70	70	65	67	..	..	..	..	....	Ascended Seibi peak, and took Theodolite angles.
70½	70½	70	..	..	..	..	..	....	
77	77	69	86	..	..	..	..	....	3*h.* 30*m.*—Party returned from Seibi.
74	75	68	..	..	..	..	..	....	

December 1862, January 1863, Chartered Steamer "Johnston Castle,"

Date.		Winds.		Weather. State.	Weather. Clouds.	Aneroid Barometer. Barr.	Aneroid Barometer. Thr.
Sun. 28th	4 A. M.	Calm	0	b v	.....	29·93	71
	10	,,	0	b y	.....	30·02	72
		S. Easterly	1	b v c.	½ cum. over the hills	29·95	81½
	9 P. M.	Lt. air	0 to 1	b v	.....	·98	77
Mon. 29th	4 A. M.	Calm	0	b v	.....	29·92	73
	8	SE to S	2 to 3				
	10	S by E	2	b v	a few str.	30·00	72
	4½	S. Easterly	1 to 2	b v	.....	29·93	82
	9¾ P. M.	Calm	0	b v	.....	·95	76
Tues. 30th	4 A. M	Calm	0	b	.....	29·88	71
	10	NE	1 to 2	b v	.....	·95	74
	4	West	2	b m c	a few str. to Wd.	·91	79
	9 P. M.						
Wed. 31st	2 A. M.	,,	,,	.....	.....	·96	75
	4	WSW	3 to 4	o u to wd. o u q	⅔ nimb. & cirri str.	29·95	74
	6	,,	6	o q	⅔ nimb. & cirri str.	30·04	72
	10		4 to 6	o q			

Khoras Shem, Khasab Bay, Tumbe Basiduh.—*Lieut. A. W. Stiffe, I. N.*

Temperature.									Remarks, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry.	Wet.			Surf.	10	20	Bottom.	
70	71	66	68	..	..	..	..	..	Decreasing tidal curves.
76	77	70	..	..	..	..	..	..	Made a general sketch of Cove S. side.
78	78½	71	86½	..	..	..	..	..	Noon.—Took Theodolite angles at a station to lengthen base and removed base flags, took azimuths at E end of base.
74	74	70	..	..	..	..	..	..	
70	71½	67½	69	..	..	..	..	..	6*h*.—Weighed and stood out of the inlet sounding. 7*h*. 50*m*.—Anchored in Khasab Bay in 4½ fathoms sand. 8*h*. 15*m*.—The Sultan's Wali came on board.
79	79½	69½	..	..	..	..	..	..	
79	79½	73	..	..	..	..	..	..	10*h*.—Landed to visit the Wali and inspect the place. Took angles on a point on the hills on east side. 5*h*.—Returned the salute from the Forts with 5 guns.
72	72½	68	..	..	..	..	..	..	
70	70½	66½	67	..	..	..	..	..	Received visits from three of the Chiefs. Made a hasty sketch.
82	82½	74	67	..	..	..	..	..	Left with Mr. Greener at 10*h*. to visit at Haraf Eideh and Ras as Sheikh.
78	78½	72	..	..	..	..	..	..	1*h*. 45*m*.—Weighed and stood out. 2*h*. 35*m*.—Anchored in 21 fathoms; Ras as Sheikh West, distant 2 miles. 4*h*. 45*m*.—Returned from Ras as Sheikh.
75	75½	69½	..	..	..	..	..	..	Midnight.—Bank of clouds to westward.
72	72½	67½	68	..	..	..	..	..	2*h*.—An arched squall approaching from SW, but afterwards passed to S. of us over the hills. Heavy westerly swell. Daylight; increasing breeze and very unsettled appearance. Weighed and stood back into the bay, and anchored in 9½ fathoms. Wind blowing in gusts off the hills. Water smooth. Observed several native vessels running for shelter under storm sails.
72	72½	64	..	..	..	..	..	..	Heavy gusts at times. Protracting the work in the inlets.

December 1862, *January* 1863, *Chartered Steamer "Johnston Castle," Khoras*

Date.		Winds.		Weather.		Aneroid Barometer.	
				State.	Clouds.	Barr.	Thr
Wed. 31st..	4	WSW	6 to 7	b c	cirri str.	29·97	72
	10¼ P. M.	,,	4 to 3	b v	.....	·99	72
Thurs. 1st.	4 A. M.	SW	1 to 2	b v	.....	30·00	68
	6	SSE	1	b c v	cum., cum., str.	·08	71
	10	Wly	1				
	4	East	1 to 2	b v c	cirri str.	·00	72
	9 P. M.	North	1 to 2	b v c	cirri & cirri str.	·02	72
Fri. 2nd. ..	4 A. M.	NE	5 to 6	b m c	cirri str.	29·96	70
	10	,,	7	b m c	Do. bank to Ed.	30·03	68
	4¼	ENE	4 to 5	b m	.....	29·95	74
	9 P. M.	,,	3 to 6	b m	.....	·95	69
Sat. 3rd ..	4 A. M.	,,	4 to 3	b	.....	29·93	66
	11	E by N	2	b	.....	30·02	70
	5	SSW	0 to 1	b	.....	29·98	77
	9 P. M.	Clam	0	b	.....	30·00	69

Shem, Khasab Bay, Tumb. Basiduh.—*Lieut.* A. W. STIFFE, *I. N.*

TEMPERATURE.									REMARKS, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry.	Wet			Surf.	10	20	Bottom.	
71	71½	62½	..	..	..	..	..	..	Sunset; windmoderating; strong gusts off the hills.
72½	73	61	..	..	..	..	..	..	Midnight.—Light breeze and fine weather.
65½	66½	60	64	..	..	..	..	..	7*h.*—Weighed and stood out at 7*h.* 55*m.*—Sounded in 52 fathoms off Ras al Sheikh and stood W¼N for the Tumb.
72	72	62	..	..	73	..	..	74	Long. WSW swell. Sounding every hour. 10*h.*—Tried temp. at bottom. 3*h.*—Tumb south, stood for it, sounding till close to the north point. 4*h.*—Anchored in 8½ fathoms on east side of Tumb about ½ mile off shore, and banked fires.
72	72½	..	..	..	..	..	..	..	
71	71½	62½	..	..	..	..	..	..	Water smooth.
70	70½	61½	64	..	..	..	..	..	1*h.*—Breeze setting in from NW, and increasing steadily; every appearance of a Nashi. 5*h.*—Strong increasing breeze and NEly sea getting up. Weighed and put to sea. Finding the breeze increase to a moderate gale and a dense haze obscuring the land: stood to northward for Basiduh roads to take in coal and water. 9*h.* 30*m.*—Anchored in the roads. Heavy sea running outside.
70	71	61	..	..	..	..	..	..	
70	70½	60½	..	..	..	..	..	..	The coal and water boats unable to come off, owing to the strength of the Nashi.
68	68½	61	..	..	..	..	..	..	Sunset.—Wind more moderate. 9*h.*—Strong gusts at times.
66½	67	59	59	..	..	..	..	..	Sights on shore for rate.
70	70½	60	..	..	..	..	..	..	Taking in coal and water.
69	69	61½	72	..	..	..	..	..	Received coal 40 tons.
65	66½	61	..	..	..	..	..	..	

January 1863, *Chartered Steamer "Johnston Castle," Basiduh to Kair.*

Date.		Winds.		Weather. State.	Clouds.	Aneroid Barometer. Bary.	Thr.
Sun. 4th ..	4 A. M.	ENE	3 to 4	b v	.....	29·99	64
	10	NE	5 to 6	b v	.....	30·03	68
	4½	SE	1 to 2	b v	.....	·04	76
	9 P. M.	Lt. Ely.	0 to 1	b v	.....	·08	70
Mon. 5th..	4 A. M.	East	2 to 3	b v	.....	30·06	67
	10	W by N	3 to 4	b v	.....	·12	67
	4		0 to 1	b v	str. to westward.	·06	71
	9 P. M.	Calm	0	b v	.....	·08	69
Tues. 6th..	4½ A. M.	ENE	1 to 2	b c v	str. to westward.	30·00	67
	10	Lt Westerly	0 to 1	b c v	cirri str. cirri.	·04	69
	4	Northerly	1 to 2	o u	cirri str. cum. str. & nimbi	29·98	74
	9 P. M.	SSE	1 to 2	o	cirri str.	·98	69
Wed. 7th..	4 A. M.	Lt Westerly	1	b c	.....	29·92	69
		NNE	4 to 5	o g v	nimbi & cirri str.		

Ras Mutaf. Farse and Bushehr. *Lieut.* A. W. STIFFE, *Indian Navy.*

Temperature.									Remarks, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry.	Wet.			Surf.	10	20	Bottom	
69½	69½	59	83	..	..	..	..	..	5*h.*—Weighed and stood out of the roads. Daylight moderate. Nashi and hollow sea on the flat. 8*h.*—Commenced sounding from edge of flat towards Turnb. 8*h.* 55*m.*—Stood to W. for Frur Island. Strong breeze, but moderating, sea smoother, sounding every half hour.
69½	69½	59½	..	..	73	..	..	72	
74	73½	62	78	..	73	..	..	72	9*h.*—Passing Frur Island, confused swell from SW & Ed. Sunset, Long. NW swell. 7*h.* 20*m.*—Anchored in 11 fathoms off the E part of Kais.
68	68	58	..	..	..	..	..	..	Island.—Water smooth P Log. 60′ since. 8*h.*—Trying strength and set of tide.
67	67	60	66	..	..	..	..	..	Sunrise weighed and stood to SW into the line and then to WNW sounding. Observed a Steamer standing to the Northward. Sounding every ½ hour, water smooth. Took a line in towards Hinderabi and out again.
69½	69	61	..	..	72½	..	..	71	11*h.*—Tried temperature.
71	71	61	79	..	73	..	..	72	3*h.*—Abreast Gorat village on Sheikh Shaib. 3*h.* 30*m.*—Tried temperature.
69	66½	58	..	..	..	..	..	..	8*h.*—Anchored in 41 fathoms mud. Tried tide maximum V to WNW tide to ENE began at 11 P. M. and weaker. To-day 87 miles of soundings.
67½	68	62	66	..	70 to 72	..	..	70	4*h.*—Tide made to WNW. Sunrise, weighed and stood to WNW. Tried temperature of bottom. Sounding every ½ hour. 11*h.*—Passed the Dutch barque *Marie.*
78	78½	65	..	..	..	..	..	..	1*h.* 15.—Tried the temperature of bottom.
70	70½	62½	70	..	73 ..	..	..	..	5*h.*—Very threatening appearance to NE heavy bank of clouds to northward.
66	66½	60½	..	..	..	..	..	..	7*h.* 15*m.*—Anchored in 21 fathoms mud off south edge of Ras Mutaf. Weather clearing somewhat. To-day 84 miles of soundings.
68	68½	61	66	..	69½	..	..	69	Daylight.—Overcast gloomy sky. Sunrise.—Weighed and made short zigzags round the edge of the bank to fix the 20 fathoms line.

January 1863, Chartered Steamer "Johnston Castle," Besiduh to Keir,

Date.		Winds.		Weather.			Aneroid Barometer.	
				States.		Clouds.	Bar.	Ther.
Wed. 7th.	10	NNE	4 to 5	o g v	8	nimbi & cirri str.	30·00	69½
	4	SE	2 to 3	o g v	8	Ditto	29·98	70
	9 P. M.	NE by E	3	b g c	8	cirri str. & cum. str.	0·	70
Thurs. 8th.	4 A. M.	vble.	1 to 2	o g u	8	cum. str.	29·94	70
	10	SE by S	3 to 4	o g u v	..	Ditto	·97	69½
	4½	NE	1 to 2	o g u p	..	Ditto	·94	69½
	10 P.M.	NNE	3 to 4	o g u	8	Ditto	·90	68½
Fri. 9th ..	4 A. M.	SSE	1	o g	8	nimbi cirri str.	29·93	68
	10	NNE	4	o g u p	..	Ditto	·96	68½
	2	SE	6					
	4	SE	2 to 3	o g r	..	nimbi	·89	68½
	9 P. M.	,,	4 to 5	o r	..	Ditto	·94	63
Sat. 10th..	4 A. M.	NE	1 2 to 3	b c g	½	.....	29·80	63
	10	N by W	3 to 4	b c g	8	cirri str.	30·03	68
	4	NW	5	b c v	½	cirri cum.	30·00	63
	9 P. M.	,,	3	b c w	..	.....	·04	63

Ras Mulaf, Farse and Bushehr.—Lieut. A. W. STIFFE, *Indian Navy.*

Temperature.									Remarks, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry	Wet			Surf.	10	20	Bottom.	
									Noon. Light confused swell, sky densely overcast with watery clouds 0·30′ stood to Wd for Farsi Island.
69	69½	60	..	..	..	..	..	..	7*h.* 30*m.*—Tried temperature of bottom. *Sunset.*—Light SE gloomy threatening appearance. Tried temperature at bottom.
70½	71	61½	71	..	69½	..	..	68	8*h.* 20*m.*—Anchored in 30 fathoms, 5 to N Wd of Farsi: could not make the Island. Trying tide; maximum velocity under 1 tide about NW & SE. To-day 94′ of soundings.
68	68½	62	..	..	..	..	..	..	
69	69½	61½	70	..	68½	..	..	68	5*h.*—Tide setting ESE. Daylight saw the Island. 7*h.*—Weighed and stood for it.
70	70	64	..	..	..	..	..	..	8*h.*—Island north ¼′ stood to NE by E Noon, very gloomy and threatening appearance, a few drops of rain at times. Heavy rain falling on the mountains.
68	68½	63½	71	..	..	..	..	..	1*h.* 45*m.*—Stood S by E. Sunset, weather the same. Water smooth. 6*h.* 10*m.*—Stood N ½ W.
67	67½	61	..	..	..	..	..	..	10*h.* 15*m.*—Anchored in 20 fathoms mud off the Asses Ears.
68	68	63½	66	..	..	..	..	..	7*h.*—Weighed and stood to W, then to WNW. Overcast, gloomy weather. Noon, tried temperature, made Imanzadeh mosque in 22 fathoms. Wind veered to SE with heavy rain and very thick weather.
67	67½	62	..	..	.. 67	..	..	67	3*h.*—Anchored in 2¾ fathom mud in Bushehr inner road. Sent the mail on shore at 4*h.*
59	58½	57	60	..	..	..	..	..	Sunset, heavy rain, densely overcast sky.
56	56½	56	..	..	..	..	..	..	
57	57½	56	55	..	..	..	..	..	Daylight, overcast with drizzling rain.
59	58	57	..	..	..	..	..	..	Landed and proceeded to Chahgudduk to wait on the Political Resident.
59	59	55	60	..	..	..	..	..	
56	57	54½	..	..	..	..	..	..	Moderate Shemal, weather clearing up.

January 1863, Chartered Steamer "Johnston Castle," Bushehr,

Date.		Winds.		Weather.		Aneroid Barometer.	
				State.	Clouds.	Barr.	Thr.
Sun. 11th.	4 A. M.	NNE	1 to 2	b c v	a few cir. & cirri cum.	30 01	63
	10 „	N by E	3	b c v	„	·11	68
	4	NNW	3	b c v	„	·05	64
	9 P. M.	Lt. air	1	b c	„	·10	63
Mon. 12th.	4 A. M.	Northerly	1 to 2	b v b v	„	---	---
	10	NNE	1 to 2	b v c	cirri str. & cum.	30·10	61
	4	NNW	3	b v c	„	·06	69
	9 P. M.	NW by N	1 to 2	o c	„	·09	65
Tues. 13th.	4 A. M.	N by E	1 to 2	o g w	cirri str. cirri cum	30·03	63
	10	Northerly	1	b c g	cirri str. bank to southward	·05	62
	4	NW	2	b c g	.....	29·94	67
	9 P. M.	NNW	2	b c g u	.....	·92	65
Wed. 14th.	4½ A. M.	NW	2	o g d p	cirri str. nimbi	29·91	64
	10	„	3 to 4	c u g	cirri cum. cirri str.	·90	66
	4	„	3 to 4	b c v	cirri str.	·92	66

to Khor Abdullah.—Lieutenant A. W. STIFFE, *Indian Navy.*

Temperature.									Remarks, &c.
	Wet Bulb.		Max. & Min.	Sun.	Sea Water				
Air.	Dry.	Wet.			Surf.	20	30.	Bottom	
52	51	51	50	..	..	..	..	..	Fine clear morning; the snow ranges beautifully clear.
58½	57½	52	..	..	..	..	..	..	Noon.—Returned from Chelgundee.
60	59½	55½	63	..	..	..	..	..	
57	58	54	..	..	..	..	..	..	
..	..	..	56½	..	..	..	..	..	
59	59	55½	..	..	..	..	..	..	
59	59	56½	60	..	..	..	..	..	Noon.—Lieut. Stiffe and Mr. Groener proceeded along the coast to find a landing place for the cable.
58½	59	56	..	..	..	..	..	..	A bank to SWd, and gloomy appearance.
58	58½	52	..	..	..	..	..	..	Took sights on shore, gloomy cloudy weather. 1*h.* 30*m.*—Weighed and stood out of the roads.
62½	61½	57½	..	..	..	..	..	..	3*h.* 5*m.*—Anchored off Rishir in 3¼ fathoms soft mud. Went on shore to sound in the boat.
63	63½	57	..	..	..	..	..	..	3*h.* 50*m.*—Weighed and stood to Wd. sounding.
62	63	59	..	..	..	..	..	..	5*h.*—Anchored in 20 fathoms soft mud. Tide slight ½′ per hour.
61	61½	58	54	..	..	..	..	..	2*h.*—Heavy showers of rain. Sunrise 7*h.* Weighed and stood to WNW sounding. Overcast sky, gloomy weather. 10*h.* Stood for Kharej to obtain a good fix, the mountains not being in sight.
60	63	59½	..	..	64	..	..	64½	Noon tried temp. Stood W by N P. M. sights.
63	62½	58½	65	..	..	..	..	..	Sunset, fine clear weather, a few clouds on horizon.

January 1863, *Chartered Steamer "Johnston Castle," Bushehr*

Date.		Winds.		Weather. State.		Clouds.	Aneroid Barometer. Barr.	Thr.
Wed. 14th.	10 P. M.	NW	3 to 4	b c v	3/8	cirri str. cirri cum.	·94	64
Thurs. 15th	5½ A. M.	North	3	b v c	3/8	.....	29·95	60
	10	,,	2	b v	..	a few air	30·01	60
	4	Northerly	1	b v	..	.....	29·92	63
	9 P. M.	Calm	0	b c	..	.....	·91	61
Fri. 16th ..	5 A. M.	North	2	c	1/8	cirri cum.	29·83	56
	10½	NW	3 5 to 6	o r u	8/8	nimbi.	·86	55
	4	NE	3 5 to 6	o g u	8/8	.....	·80	56
	9 P. M.	NW	5 to 6	b v	..	nimbi cirri str.	·88	58
Sat. 17th ..	4 A. M.	,,	1 to 2	b v	..	.....	29·88	52
	10	NW	5 to 6	b v	..	.....	·95	52
	5	,,	4	b v	..	.....	·95	67
	9 P. M.	,,	3 to 4	b v	..	.....	·95	61

to Khor Abdallah.—Lieutenant A. W. STIFFE, *Indian Navy.*

Temperature.									Remarks, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea Water.				
	Dry.	Wet.			Surf.	20	30	Bottom.	
60	60½	54½	..	..	..	..	..	..	Sights per Rigel and Polaris. Midnight.—Sky overcast; stood north. 124 miles of soundings up to anchorage.
58½	57	51½	56	..	..	..	..	..	2*h.*—Anchored in 8 fathoms mud. 6*h.* Took observations for Lat. and Long. Polaris, Vega, Antares.
57½	58	52	..	..	..	..	..	..	7*h.* 20*m.*—Weighed and stood to N by W. Standing as requisite up the Khor Abdallah.
63	64½	57½	68	..	..	..	..	..	1*h.* 8*m.*—Anchored in 10 feet mud in Khor Abdallah. Fau NE by N about 4'. 1*h.* 15*m.*—Cutter left to sound. 4*h.*—Fired 2 guns to measure a distance.
55	55½	52½	..	..	..	..	..	..	6*h.* 15*m.*—Cutter returned.
52	54	48	48	..	..	..	..	..	Daylight.—Overcast; bank to N.W. Cutter left to sound. Fired 2 guns to measure a distance. 7*h.* 30*m.*—Shemal set in with rain.
49	50	48½	..	..	..	..	..	..	5*h.*—b. g. u. p. 8*h.* 15*m.*—Weighed and stood to Southward sounding. 10*h.* 30*m.* Recalled the Cutter and stood for the bar of the river, grounded on the outer edge of the Abdallah bank.
54	54	..	..	..	..	..	..	..	2*h.*—Got off and stood for the Meyan Buoy. Very threatening appearance to NW.
52½	52½	51	..	..	..	..	..	..	6*h.* 15*m.*—Anchored off Fau in 6 fathoms. Fresh Shemal.
40	47 45	44½	43	..	..	..	..	..	Daylight, fine clear weather.
56	56	47	..	..	..	..	..	..	Landed to put up a Flagstaff. Employed surveying all day.
57 51	57 51½	51½ 48	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	Fine clear weather.

January 1863, *Chartered Steamer* "*Johnston Castle*." *Port to*

Date.		Winds.		Weather. State.		Clouds.	Aneroid Barometer. Bar.	Thr.
Sun. 18th.	4 A. M.	NW	1 to 2	b v	..	.....	29·95	51
	10	,,	6	b v	..	.....	30·00	53½
	5	,,	2 to 3	b v	..	.....	29·98	63
	9 P. M.	,,	1 to 2	b v	..	.....	·98	61
Mon. 19th.	4 A. M.	,,	0 to 1	b c v	3/8	cirri str.	29·95	57½
	9¾	,,	1 to 2	o g	8/8	nimbi & cirri str.	30·03	52
	4	,,	1 to 2	b c v	3/8	cirri str. on hor.	29·98	58½
	9 P. M.	,,	2	b c	3/8	cirri str.	30·00	59
Tues. 20th.	4 A. M.	NW	1 to 2 5 to 6	b v	..	.....	29·97	51
	10	,,	6	b v	..	.....	30·03	49½
	4¼	,,	4 to 5	b v	..	.....	·01	51
	9 P. M.	,,	2 to 3	b v	..	.....	·06	59
Wed. 21st.	4 A. M.	NW	1 to 2	b v	..	.....	30·04	57
	10	,,	3 to 4	b v	..	.....	·08	55½
	4	Calm	0	b v	..	.....	·00	61
	9 P. M.	,,	0	b v	..	.....	·02	64
Thurs. 22nd.	4 A. M.	SSW	3 to 4	b c v	3/8	cirri str.	29·92	57

Khor Abdallah, and back.—Lieutenant A. W. STIFFE, *Indian Navy.*

TEMPERATURE.									REMARKS, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea Water.				
	Dry.	Wet.			Surf.	20	30	Bottom.	
40	40½	39½	38½	..	..	..	..	..	Daylight; fine clear weather, erected a tide gauge.
48	48½	48½	..	..	..	..	..	..	Employed surveying on shore.
55	55	51	..	..	..	..	..	..	Landed the horse.
48	48½	47	..	..	..	..	..	..	5*h.* 15*m.*—Party returned.
46	46	44½	43	..	..	..	..	..	Surveying on shore. Visited Kusbeh, and measured a base at N end of Fau Grove.
49	49	45	..	..	..	..	..	..	A few drops of rain; threatening appearance to NW, afterwards cleared off.
50	50½	51½	..	..	..	..	..	..	
47	47½	45	..	..	..	..	..	..	Received a visit from the Sheikh.
39½	39	38	38	..	..	..	..	..	Daylight; sent a boat down to the 1st Buoy.
48	48½	45	..	..	..	..	..	..	Sights and azimuths on shore.
49	49½	44	..	..	..	..	..	..	Weighed and stood down the river, anchoring as requisite. Employed triangulating the river down.
49									
50	53½	49	..	..	..	..	..	..	Sunset; anchored off No. 3 Buoy.
46	46½	44	44½	..	..	..	..	..	Daylight; sent the Cutter to the Meyun Buoy. Fired 3 guns to measure the distance. Jolly at No. 3 Buoy, weighed, picked up boats and stood to SSW. Kuh Babahun very distinctly visible, stood across the tail of the bank (Abdallah) and anchored Cutter as a mark.
52	51½	48	..	..	..	..	..	..	
64	62	55½	..	..	..	..	..	..	Sounding in Khor Abdallah. Fired 2 guns to measure distances.
53	52½	50½	..	..	..	..	..	..	2*h.* 20*m.*—Anchored and recalled Cutter.
54	54½	51½	56	..	..	..	..	..	4*h.*—In Cutter. 6*h.* 35*m.*—Weighed and made zigzags down the Khor Abdallah to seaward. Moderate southerly sea, standing E. & SW by S. Increasing wind and sea. 9*h.* 15*m.*—Sights for long. *Noon.*—Barometer falling rapidly; gloomy threatening appearance. 1*h.* 45*m.*—Heavy sea and increasing gale. Stood NNW for the river. 5*h.* 40*m.*—Fresh gale, high breaking sea: unable to make the Buoy; stood off SSE for the night: on hauling out rolled very violently.

January 1863, *Chartered Steamer "Johnston Castle," Fau to*

Date.		Winds.		Weather. State.		Weather. Clouds.	Aneroid Barometer. Barr.	Aneroid Barometer. Thr.
Thurs. 22nd.	10	SSE	5 to 6 8	b c	1/8	.....	·94 ·76	60
	4	,,	7 to 8	o u	8/8	nimbi cirri str.	·84	61
	9¾ P. M.	,,	6 to 7	b c	7/8	cirri str.	·87	62
Fri. 23rd ..	3 A. M.	SSE.	5 to 6	b c v	1/8	cirri	29·86	63
	10	SE	5 to 6	c m u	7/8	.....	·92	64
	4	,,	6 to 7	b c g	6/8	cirri str.	·80	66
	9 P. M.	,,	7	b c w	..	cirri str. & nimbi	·81	65
Sat. 24th ..	4 A. M.	SE	5 to 6	b c w	..	.....	29·71	62½
	10	,,	7 to 8	o g p	8/8	nimbi	·75	60
	12	,,	7 to 6	....	..	.....	·67	..
	4	,,	6 to 5	b c g	3/8	cirri str.	·63	62
	9 P. M.	,,	3	b v c				
	10	,,	4	o u g r	..	.....	·71	65

Khor Abdallah, and back.—Lieutenant A. W. STIFFE, *Indian Navy.*

TEMPERATURE.									REMARKS, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea Water.				
	Dry.	Wet.			Surf.	20	80	Bottom.	
59	58½	55	..	..	..	..	..	..	
59	60	54	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	Vessel pitching deeply and shipping seas over all. Midnight; wind and sea more moderate.
..	..	..	58	..	..	..	..	..	3*h.*—Stood NNW. 9*h.* 15*m.*—Passed the Meyun Buoy. Heavy swell and fresh Shurgi.
64½	64	59½	..	..	..	..	..	..	Stood up the river; grounded twice.
61	61	59½	..	..	..	..	..	..	Noon.—Anchored off Fau. The party left to observe the tide were washed out of their tent by last night's high tide, a breaker, and the boat's backboard being floated away and lost. Removed the flag-staff.
59	59½	58	..	..	..	..	..	..	The whole country under water at 2 P. M., excepting the walls of the date enclosures, which were a few inches above the sea, the level ground covered about a foot deep; last night's tide was about 6 inches higher.
59	58½	57½	58	..	..	..	..	..	
62	61½	60½	..	..	..	..	..	..	Visited the Sheikh.
..	..	..	..	..	..	..	..	..	Sent on to Maamer to order horses.
63	62½	61	..	..	..	..	..	..	Working up protraction of soundings.
59	59½	58	..	..	..	..	..	..	Heavy rain lasting till midnight.

Jan. 1863, Chartered Steamer "Johnston Castle," Fau to Duusir, Khust,

Date.		Winds.		Weather. State.		Weather. Clouds.	Aneroid Barometer. Barr.	Aneroid Barometer. Thr.
Sun. 25th..	4 A. M.	ENE ESE	6 to 7 4 to 5	o g p	8/8	nimbi	29·74	54
	10	NE	1	b v	..	.....	·88	53½
	4	NW	1 to 2	b v c	1/8	cirri	·85	59
	9 P. M.	Calm	0	b v	..	.....	·88	60
Mon. 26th.	4 A. M.	Calm	0	b v	..	.....	29·86	53
	10	SE	1 to 2	b v	..	.....	·94	54
	4	Calm	0	b v c	..	a few cirri	·90	63
	9 P M.	,,	0	b v	..	.....	·92	58
Tues. 27th.	4 A. M. 6	NW	1 to 2	b g c o g	1/8	cirri str.	29·92	54½
	10	SSE	2	b v c	5/8	cirri. cum cum. to northward.	30·00	63
	5	Calm	0	b v	..	.....	29·97	57
	9 P. M.	,,	0	b	..	.....	30·00	53
Wed. 28th.	4 A. M.	NW	1 to 2	b v	..	.....	29·97	53

Abu-al-Khuseb, Basrah and Makil.—Lieut. A. W. STIFFE, *Indian Navy.*

Temperature.									Remarks, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry.	Wet.			Surf.	10	20	Bottom.	
51½	51	50½	47	..	..	..	..	..	Daylight; ran up to Maamer and anchored. Fine clear weather.
54½	54½	50½	..	..	..	..	..	..	8*h.* 50*m.*—Left with Mr. Greener to examine the right bank of the river.
59	59½	54½	..	..	..	..	..	..	11*h.* 45*m.*—Weighed and proceeded up the river, and at 1*h.* 30*m.* anchored off Duasir.
50	50½	47½	..	..	..	..	..	..	3*h.* 30*m.*—Returned from the shore, having ridden over the ground between those places.
48	48½	46	46	..	..	..	..	..	9*h.* 40*m.*—Left with Mr. Greener for the shore.
53½	52½	49½	..	..	..	..	..	..	11*h.* 30*m.*—Weighed and stood up the river. Fine clear weather; sun hot. 2*h.* 15*m.*—Anchored off Khust Fort.
58	58½	53	..	..	..	..	..	..	3*h.* 45*m.*—Returned from the shore, having examined the country between Duasir and Khust.
51½	51	47½	..	..	..	..	..	..	
51	50½	45½	47½	..	..	..	..	..	9*h.* 35*m.*—Left with Mr. Greener to continue work on shore.
52	52½	45	..	..	..	..	..	..	11*h.* 10*m.*—Weighed and stood up the river. 3*h.* 17*m.*—Anchored off Abu-al-Khuseb.
56	55½	53	..	..	..	..	..	..	Noon.—Clouds clearing off. Fine clear day. 7*h.* 30*m.*—Returned on board, having been 8 hours on horseback.
49	49½	47	..	..	..	..	..	..	
47½	48	45	42	..	..	..	..	..	8*h.* 15*m.*—Left with Mr. Greener for the shore: after an interview with the Chief, started for Busrah.

Jan. 1863, Chartered Steamer "Johnston Castle," Fau to Duasir, Khe

Date.		Winds.		Weather.			Aneroid Barometer	
				State.		Clouds.	Barr.	T
Wed. 28th.	10	NW	5	b v c	..	a few cirri cum.	30·03	59
	5½	,,	2 to 3	b v	..	.....	29·96	6
	10 P. M.	,,	1	b v	..	.....	29·96	5
Thurs. 29th	5½ A. M.	,,	1 to 2	b v	..	.....	..	
	....	Lt. N Wly.	breezes	and fine clear		weather.	..	
	P. M.	....	..	....	..	.....	..	
Fri. 30th ..	A. M.	First part	fine clear	weather	..	.....	..	
	....	....	..	....	..	.....	..	
	....	Afternoon Easter.	overcast	and gloomy		with fresh South	29·71	5
	P. M.	....	..	....	..	.....	..	
Sat. 31st ..	A. M.	First part	fine &	clear.	..	.....	29·71	
	....	Latterly	moderate		..	.....	..	
	....	Northwester		....	..	.....	..	
	P. M.	....	..	....	..	.....	..	

Abu-al-Khuseb, Basrah and Makil.—Lieut. A. W. STIFFE, *Indian Navy.*

TEMPERATURE.									REMARKS, &c.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.				
	Dry.	Wet.			Surf.	10	20	Bottom.	
53	53½	49	..	..	..	..	..	..	10*h.* 40*m.*—Weighed and stood up the river. 1*h.* 15*m.*—Anchored off Busrah Creek. Fine clear weather; moderate Shemal.
..	..	..	..	..	..	..	..	..	5*h.* 30*m.*—Weighed and run up to Makil and anchored off the Consulate. Arrived the *City of London* from Bagdad. The Boilers have been very leaky the last week, to-day they could hardly keep the fire alight while banked.
9	49	46½	..	..	..	..	..	..	
..	..	..	38	..	..	..	..	..	Employed landing tents, &c. Engineer at the engines.
..	..	..	..	..	..	..	..	..	At work on shore at protraction, packing up, &c.
..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	At work all day at accounts, charts, and reports.
..	..	..	..	..	..	..	..	..	Made over charge of the Government Stores to Mr. Bishop.
..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	

ARTHUR W. STIFFE, Lieut., I. N.,
On special duty Persian Gulf.

11. From Lieutenant F. Wherland, B. N. R., Commanding Ship "Tudor," forwarding the following three letters to the Secretary :—

"*Tudor*," 19*th March* 1863.

DEAR SIR,—Having read your discussion on the Bombay tides at the Geographical Society, I give you extracts of letters received from Liverpool some time ago.

"*Extract* 1.—One morning it was high-water at 5 A. M.; in due course the ship swung to the ebb, and continued so for two hours, when the stream suddenly returned and ran in violently, attaining a height at 8 A. M. of 18 inches above that of three hours previously. Two nights after it was high-water at about 7 P. M., and to my certain knowledge at 11 it had not ebbed more than a foot or so. These phenomena, I believe, not unfrequently occur on the South Coast; it was very lamely accounted for in the *Times* and several other papers, but no one explains why it never occurred here before. Although the gale equalled in severity the "Royal Charter Storm," we have often had *similar ones* without any effect on the tides.' "

"*Extract* 2.—I forgot to mention, that a curious phenomenon took place the day you were spoken (October 17th) in connection with the tides of the "Mersey"; it was high-water about 5 A. M., the ships swung ebb for some time, when lo, the eyes of the Liverpool people were opened by the fact that the stream had returned and the ships with it, and rose 18 inches above the previous high-water mark. It was accounted for in the *Times* by a French writer :—'The coast having been visited by a terrible gale which lasted for several days, increased the strength of the northern tidal wave, which ran on till quite exhausted, and its time for receding had arrived when the southern wave, previously baffled by its opponent, came on with double energy, and exhausted itself also.' "

For the past 15 years I have found the Rules of the Nautical Almanack sufficiently correct for *docking* purposes, but comparatively useless for navigating St. George's Channel and the Irish Sea; it is only of late that this has been put to rights by those valuable tidal observations of the late Admirable Beechy, which tell us :—"Find the time of high-water at Liverpool, from which subtract sixteen minutes, and you will have the time of the stream commencing to ebb throughout the *Irish Sea*." Now, as we sailors make as much, if not more, use of the tidal wave than any other class of men, I think it would be a boon for us to

find the time of stream turning in the Bombay offing, particularly when making the port in thick weather. The time of high-water at any of the proposed stations in this harbour will not do this. I am inclined to think, a similar phenomenon to the above takes place from the Gulf of Cambay down. I think the paper read under-estimates the effect of wind on time of high-water. I have experienced more than twenty minutes on several occasions.

I am, dear Sir, yours truly,

T. Wheriand.

"*Tudor*," 16*th April* 1863.

Dear Sir,—I should say that the tidal wave is not much affected by the storms, for its rate is about one thousand miles per hour, whilst that of the wind will only be from forty to eighty miles, blowing at right angles to the moon's attractive force; to give a homely illustration—a man creeping under a carpet would not be much affected by a proportional wind blowing over it. Now, in reading over your Society's paper, I think it is not so much with the tidal wave we have to do, as with the time and height of high-water; and although I consider it rather tance of a port like Bombay, with an Observatory, lots of officers, and not a few scientific men, taking the observations of any other port to construct their tide table, yet the formula in the Nautical Almanack is underrated. The tides, at the present time, is a very important point with seamen, some have lost their certificates for not making due allowances for their set and rate.

The Rev. Samuel Haughton, a good authority, tells us, if we take the rule alluded to above, and the port of Liverpool as our standard in the Irish Channel, and Dover as the head of the tide in the English Channel, our calculations will be sufficiently correct for all practical purposes.

The grand tidal wave moves after the moon, and coming in contact with land, banks up and gives us the phenomena of high and low water. In the Irish sea, the wave coming from the westward, one part flows up the St. George's Channel, and the other past Rathin Island, the two meet near the Isle of Man, rise to a great height, and flow over to Liverpool. This is the sort of wave we have to deal with; it is not raised by the attractive force of the moon, for the ebb is set in some

places before the wave arrives, and the tidal wave is travelling at the rate of one thousand miles per hour, when high-water is only moving from twenty to sixty. I compare it to a single vibration produced by the original wave coming in contact with the chops of the channel; here we have a horizontal instead of the original vertical force, and I think it is easy to understand why certain winds should cut it both in height and time, and the converse.

The Rev. Samuel Haughton states, that the rise is so little for many minutes before high-water, that the error for calculation in question is inappreciable, and in a note from his friend the Rev. George Gage, Proprietor and Rector of Rathin Island, that the mean range at Church Bay on that Island is from three to four feet (full and change), but that in stormy weather, its extreme range is from nine feet to two inches, according to the direction of the prevailing wind.

I think that London is a bad standard for determining the times of high-water, Brest or Dover would be better, but perhaps the best place is to be found on the coast of Australia.

* * * * *

By your next meeting I hope to give a photograph and description of the Magnetimeter, by which I think the Geographical position of a ship at sea can be estimated with tolerable accuracy without astronomical observations.

I remain, dear Sir, yours faithfully,

T. WHERLAND.

To the SECRETARY BOMBAY GEOGRAPHICAL SOCIETY.

"*Tudor*," *Bombay*, 21*st May* 1863.

DEAR SIR,—Enclosed is a description of the Magnetimeter, which model I believe to be original. The observations speak for themselves, and making due allowances for the rude way the instrument is got up, will give it a fair valuation.

If I am too enthusiastic in saying it may aid in determining a ship's position, still the experiments from such an instrument will be of value and interest, in showing the everchanging magnetism of the soft iron in ships going north and south, and consequently the variation in quadren-

tal deviation, also the bar of ordinary hard iron I hammered until it became magnetic, the polarity got shaken down from change of altitude, clearly showing that compasses corrected for semi-circular deviation by magnets are not infallible, but rather should be dealt with cautiously when there is much change of latitude. Much could be said on this subject, but it would be superfluous; the science of magnetism and local deviation having been so well handled by the first men of the day.

You will see a correction in the last but one column of the observations, it is so difficult to get the needle at a distance from the bar of soft iron, so that the means of the four deflections will exactly equal the magnetic dip.

I am, dear Sir, very faithfully yours,

T. WHERLAND.

P.S.—I send you two photographs done very hurriedly.

Lieutenant Wherland's Paper, "A description of a Magnetimeter, by which the Magnetic Dip is determined from the horizontal deflection of a magnetic needle produced by terrestrial induction in a bar of soft iron," having been read, the Secretary laid before the Society a drawing and two photographs sent by the Author. A vote of thanks was then unanimously passed to Lieutenant Wherland for his very valuable and interesting communication, as also to His Excellency the Governor.

The business of the Monthly Meeting having thus been brought to a conclusion, that of the Annual Meeting was taken up. The Minutes of the last Annual Meeting were read.

On examining the Voting Lists, the following, in order of Votes, were declared the Office-bearers for the ensuing year:—

Vice-Presidents.

1. His Excellency Lieut. Genl. Sir W. R. Mansfield, *K.C.B.*
2. The Honorable H. L. Anderson, C.S.
3. Captain W. C. Barker.

Resident Members.

1. Bhau Daji, Esq., *G.G.M.C.*
2. G. C. M. Birdwood, Esq., *M.D.*
3. R. Haines, Esq., *M.D.*
4. Commander E. F. T. Fergusson, *F.R.A.S.*

5. The Rev. W. K. Fletcher, *M.A.*
6. T. Black, Esq.
7. Commander G. T. Robinson.
8. Sir Alexander Grant, Bart., *M.A.*
9. Sir Jamsetjee Jejeebhoy, Bart., *F.R.G.S.*
10. Venayekrow Jugonnathjee, Esq.
11. J. Burgess, Esq., *F.E.I.S.*
12. The Honorable Jugonnathjee Sunkersett.

Non-Resident Members.

1. A. H. Leith, Esq., *M.D.*
2. Lieutenant Colonel A. B. Kemball, C.B., *F.R.G.S.*
3. Surgeon Major H. D. Glasse.
4. Dr. J. H. Sylvester, *F.G.S.*
5. T. C. Hope, Esq., C.S.
6. General G. LeGrand Jacob, *C.B.*
7. J. M. Erskine, Esq., C.S.
8. Dababhoy Nowrojee, Esq.

The Secretary then proceeded to place before the Society the customary brief account of the proceedings of the Session.

It is again recorded with pleasure, that the Session has been more fruitful of Papers contributed than in any former Session.

Of the eleven Papers read before the Society, five were contributed by Government and six by Authors. During the Session, the Society held eight Ordinary Meetings for the transaction of business. The following were the Papers read :—

1. Short Notes on Japan, by Lieutenant G. T. Robinson, I. N. Presented by the Author, and read before the Society at their First Meeting, September 18th, 1862.

2. Miscellaneous Observations upon the Comoro Islands, by Lieutenant Colonel Lewis Pelly. Presented by Government, and read before the Society at their First Meeting, September 18th, 1862.

3. Rough Notes, showing outline of the Country between Kurrachee and Gwadel, by Dr. James Lalor, B.A. Presented by the Author, and read before the Society at their Second Meeting, October 16th, 1862.

4. General Statement of the Progress and Prospects of the East African Expedition under Captain Speke. Presented by Government,

and read before the Society at their Second Meeting, October 16th, 1862.

5. Remarks on the occurrence of a Hurricane at the Seychelle Islands by Lieutenant Colonel Lewis Pelly. Presented by Government, and read before the Society at their Third Meeting, November 20th, 1862.

6. An Account of the Dimension and Movements of the late Cyclone experienced at Bombay on the 22nd of November last, by Lieutenant E. F. T. Fergusson, I.N., *F.R.A.S.* Presented by the Author, and read before the Society at their Fourth Meeting, December 18th, 1862.

7. Report on the operations of the Great Trigonometrical Survey during 1860-61. Presented by Government, and read before the Society at their Fourth Meeting, December 18th, 1862.

8. Remarks on the Bombay Tidal Observations for 1861, by J. Burgess, Esq., F.E.I.S. Presented by the Author, and read before the Society at their Fifth Meeting, January 15th, 1863.

9. Further Discussion of the Tidal Observations made for Government at the Colaba Observatory in 1861, by J. Burgess, Esq., F.E.I.S. Presented by the Author, and read before the Society at their Sixth Meeting, February 19th, 1863.

10. A few cursory Observations upon the Island of Mahé, the largest of the Seychelle Group, by Lieutenant Colonel Lewis Pelly, late Acting Consul and British Agent at Zanzibar. Contributed by Government.

11. Description of a Magnetimeter, by which the Magnetic Dip is determined from the horizontal deflection of a Magnetic Needle produced by terrestrial induction in a bar of soft iron, by Lieutenant F. Wherland, R. N. R., Commanding the Ship "Tudor." Presented by the Author, and read before the Society at their Annual Meeting, May 21st, 1863.

The Members numbered on the Society's List at the last Annual Meeting were 108. Since then there have been removed.

By Death—2.

1. J. J. Berkley, Esq., C.E.
2. C. Daly, Esq., C.S.

By retirement from India—19.

1. Admiral G. G. Wellesley, C.B., R.N., *F.R.G.S.*
2. Commodore J. J. Frushard, I.N.
3. Captain G. Jenkins, C.B., I.N., *F.R.G.S.*
4. Captain C. G. Constable, I.N., *F.R.G.S.*
5. Captain B. Hamilton, I.N.
6. Commander W. M. Pengelley, I.N.
7. Commander G. T. Holt, I.N.
8. Commander A. D. Taylor, I.N., *F.R.G.S.*
9. Commander J. G. Nixon, I.N.
10. Commander R. W. Whish, I.N.
11. Lieutenant A. M. Sweny, I.N.
12. Lieutenant A. W. Stiffe, I.N.
13. Lieutenant C. Forster, I.N.
14. Lieutenant G. L. Lewis, I.N.
15. Lieutenant H. Burn, I.N.
16. Superintending Surgeon C. F. Collier.
17. Surgeon Major J. A. Fraser, M.D.
18. A. Dando, Esq.
19. D. White, Esq.

By resignation of Memberships—

1. Lieutenant R. G. Watson.
2. Surgeon J. Vaughan, *F.R.G.S.*
3. The Rev. R. Galbraith, M.A.
4. F. D. Faithfull, Esq.
5. Surgeon F. Broughton, *F.R.C.S.*
6. The Honorable H. Hebbert, C. S.

From various other causes 7, or in all 34 Members. On the other hand, there were admitted to Membership the following:—

1. T. Diver, Esq., M.D.
2. Sir Alexander Grant, Bart., M.A.
3. The Honorable M. H. Scott.
4. Colonel H. J. Barr.
5. J. Burgess, Esq., F.E.I.S.
6. E. P. Repton, Esq.
7. W. T. Stevens, Esq.
8. Surgeon Major W. Campbell, M.D.
9. C. Ferjett, Esq.

10. Dr. James Welsh.
11. W. M. Coghlan, Esq., C.S.
12. Professor J. P. Hughlings, B.A.
13. Dr. James Lalor, B.A.
14. Sorabjee Pestonjee Framjee, Esq.
15. Professor F. J. Candy, M.A.
16. Cowasjee Jehangirjee Readymoney, Esq.
17. C. M. Keir, Esq.
18. R. Knight, Esq.
19. W. F. Stearns, Esq.
20. G. W. Terry, Esq.
21. W. Tracey, Esq.
22. The Honorable H. Newton, C.S.
23. The Honorable Rustomjee Jamsetjee Jejeebhoy.
24. H. Miller, Esq., M.D.
25. Karsandas Madhavedas, Esq.
26. Homejee Cursetjee Dady, Esq.
27. Cowasjee Maneckjee, Esq.
28. K. R. Kama, Esq.

In all 28 Members, making the total number of Members 102 at present.

James John Berkley, Engineer-in-Chief in India of the Great Indian Peninsula Railway, died at his home at Sydenham, on the 25th of last August, at the early age of forty-three years. Highly accomplished, and possessing more than ordinary engineering abilities, Mr. Berkley found a firm and attached friend in the late Mr. Robert Stephenson, who entertained so high an opinion of his talents and character as to associate him with his professional life, and at an early age to entrust him with the very responsible office of Chief Engineer of the Charnet and Trent Valley Railways, and finally by whose advice he was appointed Engineer-in-Chief in India of the Great Indian Peninsula Railway. Mr. Berkley had thus the honour of constructing and opening the first Indian Railway, and at a time when the passage of locomotive engines up long and very steep gradients was deemed to be somewhat doubtful. He designed the two great Inclines over the Bhore and Thull Ghauts. The successful public opening of the Bhore Ghaut last month, by His Excellency Sir Bartle Frere, bore ample testimony to the boldness and skill of him who did not survive to witness the suc-

cessful opening of a work deservedly monumental of English Engineering, and of its talented originator and constructor.

Cornelius Daly, of the Bombay Civil Service, was born at Cork in 1835, and was educated at Queen's College, of that city. He arrived at Bombay in 1856, where, on his return from Scinde, he died on the 3rd of February last.

The abolition of the Indian Navy, and consequent retirement from India of most of its Officers, deprives the Society of several of its deservedly popular and valuable Members, of whom may be mentioned Captain Griffith Jenkins, C.B., *F.R.G.S.*, whose membership dates back from 1838, and to whose unwearied exertions in the behalf of the Society, our Proceedings bear ample testimony. Captain Constable, *F.R.G.S.*; Commander A. D. Taylor, *F.R.G.S.*; Commander Whish, and Lieutenant Stiffe, all accomplished Hydrographers, have contributed valuable Papers to our Transactions, and who have by their hydrographical labours on the coasts of India, successfully upheld the scientific character so justly attributed to the late Indian Navy.

Dr. Collier, Deputy Inspector General of Hospitals, joined the Society in 1837. By his retirement therefore, the Society has to regret the departure of their Senior Member. When Surgeon of the 2nd Bombay Light Cavalry, Dr. Collier contributed a Paper "on the Nature of the Soils of the Bombay Presidency."

The 16th Volume of the Society's Transaction was placed in the hands of Members during last month; and steps are being taken whereby the forthcoming Volume will be very much expedited.

The Annual Statement of Receipts and Disbursements on account of the Society, from 1st May 1862 to 30th April 1863, submitted to the Society, showed the following balance to their credit :—

In the Treasurer's hands .. Rs.	1,243	11	4
In the Secretary's hands .. „	95	10	5
Total Rs..	1,339	5	9
Add—			
Amount under recovery.....	465	0	0
Grand Total... Rs.	1,804	5	9

Major Annesley and Mr. Burgess having been unanimously appointed Joint Auditors to examine the Society's Cash Accounts, the Honorable Mr. Frere observed, that at a meeting of the Committee, an application, received from the Society's Clerk, Balvant Krishnaráo Palekur, for increase of pay, was submitted. Mr. Kennelly, supported by Dr. Birdwood, strongly urged that an increase of Rs. 20 be granted. The Committee therefore, in consideration of the financial state of the Society, sanctioned the proposed increase.

It was then moved by Dr. Bhau Dáji, and seconded by Sir Jamsetjee Jejeebhoy, Bart., that the report submitted by the Secretary be adopted, and that a vote of the Society's warmest thanks be passed to the Honorable President, to the Secretary, and also to the Office bearers of the past year. The meeting then adjourned to Thursday, September 17*th*, 1863.

SESSION 1863-64.

First Meeting, *September 17th*, 1863.

The Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 17th instant, at half past 4 P.M.

Present.—Captain W. C. Barker, *Vice-President*, in the Chair; Captain J. F. Jones; George Birdwood, Esq., M.D.; J. Burgess, Esq. *F.R.I.S.*; J. E. C. Pryce, Esq.; Professor F. J. Candy, M.A.; Commander G. T. Robinson, *Members*: and D. J. Kennelly, Esq., *F.R.G.S., Secretary.*

The Minutes of the last Meeting were read and confirmed.

Elections.—Cursetjee Furdoonjee Paruck, Esq.; Manockjee Sorabjee Ashburner, Esq.; and Burjorjee Sorabjee Ashburner, Esq.

Members proposed.—Lieutenant G. C. Parker; J. Firth, Esq.; J. Sands, Esq.; G. Steel, Esq.; and Rustomjee Ardaseer Wadia, Esq.

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1.—Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. XX., Part 2. By the Society.

2.—Journal of the Ceylon Branch of the Royal Asiatic Society, for the years 1858-59 and 1860-61. By the Society.

3.—On the Origin and Distribution of the Regur of Black Cotton Soils, by Captain Aytoun. By the Author.

4.—Catalogue Raisonné of Rare, Valuable, and Curious Books, for May, June, and July 1863. By Bernard Quaritch, Esq.

5.—Annual Report of the Agri-Horticultural Society of Western India, for the year 1862. By the Society.

6.—Rules and Regulations of the Bombay Branch Royal Asiatic Society. By the Society.

7.—Nautical Almanac and Astronomical Ephemeris for the year 1862. By J. Burgess, Esq., *F.E.I.S.*

8.—Report on Vaccination throughout the Bombay Presidency and Sind, for the year 1862. By the Principal Inspector General Medical Department.

9.—Papers relative to the Introduction of Revised Rates of Assessment into the Mawul Talooka of the Poona Collectorate. By Government.

10.—Papers relative to the Introduction of Revised Rates of Assessment into the Dhoolia and Chalisgaum Talookas of the Khandeish Collectorate. By Government.

11.—Papers relative to the Canal Irrigation in Sind, with suggestions for its improvement, with Plans. By Government.

12.—Om Komet banernes Indbyrdes Beliggenhed. By H. Mohn, Esq., Christiania.

13.—Om Siphonodentalium Vitreum. By Dr. M. Sars, Christiania.

14.—Beskrivelse over Lophogaster Typicus. By Dr. M. Sars, Christiania.

15.—Om Oriklers Bergring. By C. M. Guldberg, Esq., Christiania.

16.—Geologiske Undersogelser Bergens Omegn. By Dr. T. Kjerulf, Christiania.

17.—Synopsis of the Vegetable Products of Norway. By Dr. F. C. Schübeler, Christiania.

18.—Meteorologische Beobachtungen auf gezeichnet auf Christiania's Observatorium.

19.—Memoirs of the Geological Survey of India. By the Bengal Government.

Letters read :—

1.—From the Rev. D. Macpherson, Lieutenant T. M. Philbrick, and Dr. G. E. Seward, requesting to withdraw their names from the List of Members.

2.—From Lieutenant General Sir W. R. Mansfield, K.C.B., T. Black Esq., Sir Jamsetjee Jejeebhoy, Bart., and Venayekrao Jugonnathjee, Esq., acknowledging with thanks letters from the Secretary, intimating their re-election as Office-bearers for the year 1863-64.

3.—From Commander E. F. T. Fergusson, Messrs. Thacker, Spink and Co., the Secretary Madras Literary Society, the Secretary Bombay Mechanics Institute, the Director of the Trevandrum Observatory, the Secretary to the Ceylon Branch of the Royal Asiatic Society, acknowledging with thanks copies of Vol. XVI. of the Society's Transactions.

4.—From General G. LeGrand Jacob, C.B., requesting copies of Vols. XIII. and XIV. of the Society's Transactions.

5.—From Dr. D. C. Orio, Cashmir, requesting to be informed of the maximum and minimum temperature in the Indian Ocean, Bab-el-mandeb, and the Red Sea.

6.—From the Honorable H. L. Anderson, Chief Secretary to Government, forwarding printed copies of reports by Lieutenant Colonel Lewis Pelly, with reference to the Persian Gulf.

7.—From J. Burgess, Esq., *F.E.I.S.*, forwarding the following letter on the Bombay Harbour Tides :—

To the SECRETARY BOMBAY GEOGRAPHICAL SOCIETY.

SIR,—Among the others letters read at the meeting of the Bombay Geographical Society yesterday, there were two communications on the tides from Captain F. Wherland, of the Ship *Tudor*, but being the Annual Meeting of the Society, there was no favourable opportunity for making remarks on them. I beg therefore to submit to you the following observations :—

In his first letter, dated 19th March, Captain Wherland gives it as his opinion, that I "under-estimate the effect of the wind on the time of high-water," and says he has experienced a difference of "more than twenty minutes on several occasions."

To this I would reply that, severe storms blowing for any considerable length of time, may perhaps influence the tides to an extent which we have not data for estimating. But severe storms are exceptional phenomena, and what we have to do with in estimating the effects of the winds on the times of tide, is not exceptional cases that may occur only once or twice (if so often) in the course of twelve months, but the effect of such winds as are of *frequent* occurrence, and consequently differing within moderate limits only from their average force. Now I think we have no sufficient data to show that their effects are greater then I have allowed.

In the case of ports like Bombay, within the tropics, where the prevailing direction of the wind varies with the sun's declination, their average effects will be masked under those dependent on the declination. Hence proper formula, founded on sufficient observations, would, in such cases, include the mean effects of this disturbing cause, and it would only be in extreme cases that they could farther materially alter either the time or the height of the tide.

I am inclined to think the difference Captain Wherland supposes he has observed, may be explained in one of the following ways:—Either, depending on the accuracy of the Nautical Almanac method, he probably computed the time of high-water by it, and finding it did not agree with observation, he attributed the error to the wind, when in reality it was owing to the error of the method of computation; or, perhaps he counted the time of flood tide as coinciding with the time of slack water, which has often been done, and whilst the tide really "made its mark" at the computed time, the current turned "more than twenty minutes" later. Observations of such a kind, to be trustworthy, must be made at ports for which really good tide tables are prepared; such as London, Plymouth, Bristol, Liverpool, Brest, &c. Comparisons with times computed by the Nautical Almanac method in use, are only trustworthy at full and change: immediately after the 'quarters' the computed times are erroneous—but much less so between places where the tides are of about the same age, than between those for which the

ages greatly differ. Thus, for ports in the Irish Sea and St. George's Channel, the times derived from those of Liverpool will always be approximately correct, but for the coasts of Africa or the Indian Ocean, there must be considerable errors in computing the times of tide from those of any British port.

In his second letter, dated 16th April, Captain Wherland seems to have come to the same conclusion as I had in regard to the effects of the wind.

He makes an important suggestion however in his first letter, which I hope the Society will not lose sight of; namely, the necessity of making observations in the offing as to the time when the stream turns, for the guidance of Captains, "particularly when making the port in thick weather."

His valuable communication on the Magnetimeter I trust will receive the consideration it seems to deserve.

Hoping that other intelligent Captains who visit our port will be stimulated by the example of Captain Wherland's zeal to contribute their quotas of information to the Society for general use.

I am, my dear Sir,
Ever yours sincerely,
J. BURGESS.

The first Paper read was on a Method of Computing the Times of the Moon's Rising and Setting, by J. Burgess, Esq., *F.E.I.S.*

Mr. Burgess said :—

"Owing to the rapid variations of the moon's declination, angular motion from the sun, and horizontal parallax, the determination of the times of her rising and setting is much more complicated than the analogous problem for sunrise and sunset. The necessity of repeating the calculation, after finding an approximate time, renders the usual method of computation tedious. The writer showed, that by constructing a table of the *lunar* semi-diurnal arcs for any proposed latitude, employing the *mean* values of the moon's angular motion from the sun and horizontal parallax, the times of rising and setting might be obtained from the time of southing at once with a considerable degree of accuracy, and the correction for variations of parallax and of angular motion

being also tabulated, they might at once be applied to obtain the corrected times.

"The paper consisted chiefly in the investigation of the formula for the construction of the tables, followed by the two necessary tables for the latitude of Bombay, with examples of their use."

At the conclusion of this paper, Mr. Burgess was cordially thanked.

The second and third Papers read, were "On the Tribes, Trade, and Resources around the shore line of the Persian Gulf" and "Account of a recent Tour round the Northern portion of the Persian Gulf." Both papers were from Lieutenant Colonel Lewis Pelly; they were presented by Government.

The Secretary having concluded the perusal of these two papers, the thanks of the Society were cordially voted to His Excellency the Governor in Council, and the Meeting adjourned to *Thursday, October 15th*, 1863.

SESSION 1863-64.

SECOND MEETING.—*October 15th*, 1863.

THE ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday the 15th instant, at half-past 4 P.M.

Present.—The Honorable W. E. Frere, C.S. *F.R.G.S., President*, in the Chair; Captain W. C. Barker, *Vice-President*; G. C. M. Birdwood, Esq., M.D.; J. Burgess, Esq., *F.E.I.S.*; Professor F. J. Candy, M. A.; Lieutenant W. L. Searle, *F.R.A.S.*; Venayekràc Jugonnathjee, Esq.; the Rev. W. K. Fletcher, M.A., *Members*: and D. J. Kennelly, Esq., *F.R.G.S., Secretary*.

The Minutes of the last Meeting were read and confirmed.

Elections.—Lieutenant G. C. Parker, J. Firth, Esq., J., Sands Esq., G. Steel, Esq., and Rustomjee Ardaseer Wadia, Esq.

Member proposed.—H. H. Swan, Esq.

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1.—Observations on the Tides with reference to the computation of the Times of High Water at Bombay, 1864, by J. Burgess, Esq., *F.E.I.S.* By the Author.

2.—Remarks on the Tides, by J. Burgess, Esq., *F.E.I.S.* By the Author.

3.—Report of the Students' Literary and Scientific Society for the Session of 1862-63. By the Society.

4.—Bulletin de la Société de Géographie, Cinquième Serie Tome V. By the Geographical Society of Paris.

5.—Papers relative to the Introduction of Revised Rates of Assessment into the Rajpoorie Talooka of the Colaba Sub-Collectorate. By Government.

6.—Papers relative to the Introduction of Revised Rates of Assessment into the Walwa Talooka of the Sattara Collectorate. By Government.

7.—Papers relative to the Introduction of Revised Rates of Assessment into the Mahim Talooka of the Tanna Collectorate. By Government.

8.—Report of the External Commerce of the Presidency of Bombay for the year 1862-63. By Government.

Letters read.—The following letters were then read :—

1.—From the Secretary Royal Geographical Society of London, acknowledging the remittance of £23-10-0 on behalf of the Wheeler Relief Fund.

2.—From Commander E. F. T. Fergusson, Superintendent Colaba Observatory, forwarding a copy of the Cõlaba Observations for 1862.

3.—From the Keeper of the National Museum of the Antiquities of Scotland ; Librarian, University of Aberdeen ; Secretary, St. Andrew's University Library ; Librarian, Bodleian Library, Oxford ; Secretary Meteorological Society of Mauritius, and Superintendent of the Mauritius Observatory, acknowledging with thanks the receipt of Volume XVI. of the Society's Transactions.

The business of the Meeting having been concluded, the Secretary offered the following remarks on the Bombay Magnetical and Meteorological Observations for the year 1862:—

The presentation to the Society of the Bombay Magnetical and Meteorological Observations for 1862, affords an opportunity not unsuitable for making a few remarks upon these volumes, and on the history and work of the Colaba Observatory. These annual volumes have come now to be received as a matter of course,—they do not seem to excite much attention on the part of this Society, nor to be frequently consulted. It may not be altogether amiss then, on the present occasion, to refresh the memories of the members by a recapitulation of the past history of the Observatory, noticing also its relation to science, the work it has done, and what ought still to be expected from it. Indeed, it seems desirable that this Society, with whose pursuits its duties are most closely connected, should take a warm interest in its operations.

In the year 1828, observations of the magnetical phenomena were commenced systematically, from which time different countries, and especially England, aided by their respective Governments, have established observatories in all the most advantageous positions on the earth's surface, with the view of determining the value of the "magnetic elements" and their changes.

The Bombay Observatory was originally commenced by the Government of the East India Company at the suggestion of the Royal Society conveyed through Colonel Sykes, who has ever taken the greatest interest in the advancement of science. In March 1841 he requested Professor Orlebar to take charge of the instruments and superintend the erection of the Observatory. On accepting this duty, Professor Orlebar says—I was not a little dismayed at finding myself, not only without guidance as to the nature of the building, but also as to the parts and objects of many of the instruments which were of course quite new to me." It however chanced that Mr. Caldecott, of the Travancore Observatory, whose "Observations on the Direction and Intensity of the Terrestrial Magnetic Force in Southern India have proved to be of so much value, happened to pass through Bombay at the time, and by his assistance relieved Professor Orlebar from his difficulties and put him in the way of commencing operations. The buildings were accord-

ingly completed before the rains. "Numerous difficulties," he says, "particularly in setting up the bifilar occurred through my previous ignorance of the instruments, and from my destitution of assistants; so that it was not until the first week of September that the Magnetometers were permanently fixed." From that date Professor Orlebar began his observations and continued them till he left for England in May 1842. Besides the Native Assistants, he had the aid of three Non-commissioned officers from the Sappers and Miners—one of whom, Serjeant Dunn, seems to have been an enthusiastic and laborious observer, to whose diligence we are much indebted for the accuracy of the earlier observations. Another of the three proved a different character, and the detection of his untrustworthiness threw doubts on the value of his observations, in consequeuce of which he was dismissed,—a warning to superintendents not to repose too much confidence in Assistants, nor to leave their observations for any length of time without personally testing them.

In 1845 Government supplied a set of small instruments, and for their reception a small Observatory was then erected at the North-east corner of the large one. When it was completed the instruments were arranged and set up by Serjeant Dunn and the head Native Assistant Keru Luxuman. The possession of these small instruments permitted the permanent closing up of the Magnetometer box, "and, this," says Professor Orlebar, "was very necessary on two accounts. The Observatory had been very much troubled by a very minute spider, which makes its way through the smallest opening, and often spins its web about the magnet bar, which is thus disabled from freely taking up its position. Further it was necessary to check the vibrations which seemed to be caused principally by currents of air circulating within."

The Observatory was now in possession of nearly all the instruments it yet has, and Professor Orlebar resumed charge of it from Dr. Buist in April 1845. The following testimony to the labours of Dr. Buist while in charge of the Observatory, appears in the address delivered by Sir Roderick Murchison to the Royal Geographical Society at the Anniversary Meeting of 1861:—

"In July 1842 he was placed by Government in charge of the Bombay Observatory. The appointment was unsalaried, but his duties were so successfully proceeded with, that in the course of three and a

half years upwards of three hundred thousand observations had been made, corrected, recorded, and prepared for publication ; and Government was pleased on six several occasions to express their approbation of his exertions. On the 14th November 1845, Sir David Brewster, in moving the thanks of the St. Andrew's Philosophical Society to Dr. Buist, states—That he had much occasion to correspond with the Observatories in all parts of Europe, organized for like purposes with that of Bombay, and that no where in England, no where on the Continent had he seen anything like so large an amount of work done as had been carried out by Dr. Buist." In addition to the astronomical department, Dr. Buist organized and introduced an extensive system of tidal and meteorological observations, from Cape Comorin to the Red Sea. Besides these labours, immediately bearing upon the Observatory, Dr. Buist volunteered, while in charge of it, to give lectures on Natural Philosophy, Chemistry, and Natural History to the young Officers of the Indian Navy."

While at Oxford Mr. Orlebar tried to make out the empirical laws of the variations in declination for the shorter periods, and his results appear to agree generally with the movements of the needle in Southern Europe. But the observations to which he applied his formulæ extend over a short period only, and owing to this and to the smallness of the differences at the hours of the maxima and minima, compared with the variations of other times, it became difficult to fix the turning hours with accuracy.

The volume now laid before the Society is the twentieth that has been printed, and contains the observations of last year.

The magnetical observations are taken hourly for declination, horizontal, and vertical forces. From these are determined the absolute horizontal and vertical forces and the computed dip. The inclination is also observed with a dip circle about 11 in the forenoon twice a week. Once a month term-day observations are taken about once in every five minutes, and when occasional disturbances occur, observations are made at intervals of 15 minutes.

The meteorological observations are more numerous, and are made hourly for the weight, temperature, dew-point, humidity, and electrical condition of the air ; the temperature of the ground at 1 and 9 inches below the surface, the direction and force of the wind, the quantity of

rain, and the state of the weather. Extraordinary electrometer observations are also made during periods of electrical disturbance. In connection with these observations it may be remarked in passing, that it seems strange, notwithstanding the great progress that has been made by men like Bravais, Regnault, Apjohn, and Glaisher in this science during the last twenty years, the Superintendents should not have felt it necessary to change their tables for the temperature of dew point and the pressure of moisture, but, as stated in the present volume, still use those prepared by Professor Orlebar.

To the magnetical and meteorological observations were added, in 1846, self-registered observations on the tides. A discussion of these for the first two years by Mr. Orlebar was inserted at the end of the second volume for 1847. Whether from the defects of the tide gauge, however, or partially also from the want of sufficient care on the part of the observers, these observations have somehow failed to give satisfaction.

Attention was directed to them last year in a paper read before the Society by our indefatigable member Mr. Burgess, under the title of "Tidal Results for 1862." This paper was based upon the resultant obtained by its author from a laborious reduction of the observations of the whole year, and here, in passing, I would take the opportunity of offering that gentleman my cordial thanks for the assistance he has afforded me in drawing up these remarks.

We find a discussion of the observations for the last sixteen years inserted at the end of the present volume, occupying its last 26 pages. This has been made "with the view," we are told, "to ascertain if greater accuracy could be obtained by the data now available." To this problem, however, no direct answer is supplied, and though a large amount of time and labour must have been bestowed on the work, we seem no nearer a solution than we were before.

It will perhaps be asked by some who have not given much attention to the subject, whether such observations are of practical value and are worth the expense of making them? Now, in reply, it ought at once to be asserted, that what is called the "practical value" of the applications obtainable from scientific observations, is not a fair criterion of their importance, and ought to weigh as little as possible with those who have to deal with them. Modern science may indeed justly lay

claim to almost every improvement in our industrial arts and manufactures, but these are perhaps not her highest triumphs. She has taught us indeed to employ her truths for our own advantage, but she also teaches us the higher lesson of appreciating those truths for their own sake, as well as for the results we may yet hope to obtain from them; and the study of truth and its influences direct or indirect, upon the mental and moral habits of man, is far beyond the commercial value of all the advantages themselves alone considered that have resulted from the application of science to the advancement of man's physical welfare. Truth itself is more valuable than its applications, which can scarcely be said to be within the province of true science. But meteorology and magnetism have already yielded applications of no small importance to human welfare, and we know not what they may yield in the future. Admiral Fitzroy's Storm Signals have proved what use may be made of the accumulated observations of many years, so uninteresting to turn over, but yet so well worth all the trouble of collecting.

Terrestrial magnetism is one of the very youngest of the sciences. Cavallo, Lorimer, and a few others towards the end of the last century introduced it, but it was not until 1819 that Hansteen's famous dissertation was published. The Göttingen Magnetic Observatory was only erected in 1833 by the celebrated Gauss, who first so ably sketched the mathematical theory of this science: and Arago and Humboldt had not long preceded him in erecting the first observatory of the kind. Owing to the great attention, however, which it has attracted from the different Governments of Europe, it has made most remarkable progress within the last twenty years. We cannot divine what mysteries it may yet reveal, but from the discoveries already made, we cannot hesitate in employing in relation to it the words of Humboldt—"When we see new light dawning from a previously unknown group of phenomena in the material world, we may the more hopefully think ourselves on the verge of new discoveries, if the relations of the new facts to those with which we were previously acquainted appear obscure or even contradictory.

Like all the other physical sciences, terrestrial magnetism primarily demands the aid of extensive and varied observations, without which it cannot be advanced. In a word, to quote again from the same illustrious author—"The surest means of exhausting the measurable variations

as respects space, and of enlarging and completing the mathematical theory of terrestrial magnetism, is to prosecute continuously, successive determinations of the three magnetic elements at well chosen points of the globe."

It may be asked, however, if there is any special reason why the Colaba Observatory should be maintained? This is surely not difficult to answer. In Europe, there are of course many such observatories, and the disappearance of one or two might be no very great loss. The European Governments, however, do not seem to lose sight of them, and at the opposite extremities of the Continent, Russia and Portugal are at present giving extension to such observations. In magnetic and meteorological research, much depends upon the equable distribution, as far as practicable, of the observations over the surface of the globe. The Hobarton Observatory in Van Dieman's Land has done great service; and at the southern extremities of Asia, those of Singapore and Trivandrum have not been without their own importance. The latter, we are told, is to be closed at the end of the present year, thus leaving the Bombay Observatory, and it only, to form the middle link for the connection of those of Europe with the Observatories of the remoter East. As the magnetic equator passes through Southern India, Bombay is found to be only 8 degrees from it, and also within a few degrees of the line of no declination which passes it to the West, whilst geographically it is not far from the Northern tropic, thus occupying a position closely analogous to that of Rio Janeiro or of the St. Helena Magnetical Observatory in the other hemisphere. Locally, therefore, its position possesses specialities which seem to require us to avail ourselves of them for the supply of the desiderata of magnetical science, and if the observations are made with sufficient accuracy, they may possibly, when reduced, be as valuable as those made at St. Helena. What has hitherto prevented their being utilized for the advancement of science is, that with the exception already mentioned, no systematic reduction of them has hitherto been attempted, and thus, whilst the observations at St. Helena, the Cape, Trivandrum, Singapore, &c. are constantly referred to and employed by physicists, the Bombay observations are never alluded to, the early volumes excepted.

But until an attempt is made to reduce the accumulated observations, we cannot know their real value with any approach to accuracy. They may be utterly worthless, or of the most valuable character, for any

thing we can tell. It is truly a pity that for nearly 18 years no serious attempt has been made to test the value of the materials offered in these large and costly volumes.

Again, in relation to meteorology,—with the changes of which magnetic phenomena appear to be immediately connected—located as it is within the tropics on a coast where the SW. monsoon blows directly home, and which otherwise is so well situated in reference to the configuration of the neighbouring coasts, Bombay affords as good a point as could easily be fixed upon for studying the meteorological laws of this portion of the tropical zone; and as these laws will probably be found better defined and less complicated than those of higher latitudes—when sufficient observations shall have been collected and fully collated—they may not only throw valuable light on the atmospheric conditions of the middle regions, but also materially help to guide us in disentangling the more complicated relations of the meteorology of the temperate zones.

These remarks may be sufficient to indicate the character of the position the present observatory occupies, and it is hoped they may help to increase the interest of this Society in its work.

Before closing, another remark seems called for by the volume now presented, and it is to be regretted that it should be necessary to make it, and even to apply a similar one to several of its predecessors. A cursory glance at this and some of the other volumes has revealed instances of misprints and other errors, which detract not a little from our confidence in the whole. In a volume of between 600 and 700 pages of figures, it would not be at all remarkable or blameworthy if one or two typographical errors were detected by a searching scrutiny; but it tends greatly to raise our suspicions of the value of many of the numbers offered us, when evident mistakes and improbable values turn up to the superficial glance. Thus, at the bottom of page 123 of this volume, we are told that the dip, as obtained from observation on the 30th December, was 19 deg. 26·9 min., but on page 126 it is entered again as only 19 deg. 24·7min., one of these numbers must evidently be wrong. And then looking at the other values of this element for December, it appears that on this date and on the 19th, the observed inclinations entered are nearly a whole quarter of a degree above the average of the other values. Can this be correct? On refer-

ring to page 28 of the Results, we find that the computed values on these two days averaged less than one minute in excess of the mean value for the month. It is very desirable that, when observations appear so abnormal, we should have some security that they were repeated at the time, and are fully trustworthy. On the occasion first mentioned there is no magnetic disturbance chronicled, and the two suspected observations alone raise the mean value for the month 41·3 min. above what the other observations give, and make it agree better with the value obtained by calculation. Other instances very similar might be pointed out. Errors in the decimal points are of too frequent occurrence, and cases occur in some of the volumes where the printed "mean" of a series of observations does not appear correct on trial. In one instance 44·5 is given in the Observations and 44·1 in the Results, but on taking the mean of the numbers whence it is derived we find 44·8 ; now the most reasonable amount of care ought to prevent mistakes such as these, and they are only too abundant; two and three errors having been observed on a single page and as many on the next. It is just possible that a careful comparison with the manuscript copies might be of use in detecting the majority of the errata, which ought to be printed along with the next volume of observations. As they stand at present, it would not be surprising if they considerably increased the difficulty of deduction. Then the co-efficients of the corrections seem to be altered from time to time, without the causes being sufficiently explained. It would be satisfactory if the processes and data by which these important elements are determined, were given with necessary detail in the introductions, sometimes, indeed, as in the volume for 1861 fuller details are given, but there is a want of uniformity in this.

But it is a very invidious task to point out mistakes and defects, which should only be done as a matter of duty and with a view to their remedy. Enough has probably been said to convince the Members of this Society that, whilst it is desirable the Observatory should continue its operations, it is of the utmost importance that the observations themselves should be made with the greatest possible care, and with the addition of such new observations as the recent advances of science have shown to be requisite. Investigations in terrestrial magnetism have recently shown that errors in some of the observations at one place, may be detected by comparison with the synchronous observations made at others. This discovery might perhaps be of use in the discussion of the

observations already collected, and which it seems so desirable should be reduced as soon as possible.

The President then observed, that the Society was much indebted to Mr. Kennelly for the remarks he had made on the new volume of Observations, and that he thought this a very favourable opportunity for bringing to the notice of Government such improvements as might be introduced into the Observatory at Colaba. Lieutenant Searle had only lately been appointed to the charge of the Observatory, and he could not consider any remarks the Society might make in any way personal; while Captain Fergusson, who had recently left the appointment, had laid the Society and individual members of it, under too many obligations for it to be supposed that the President or any Member of the Society could feel otherwise than friendly towards him. He would, therefore, suggest that the Members of the Committee then present, should be appointed a Sub-committee to draw up a letter to Government, setting forth the importance of maintaining their Observatory at Colaba in a high state of efficiency, of improving the instruments and observations to be made there, and of reducing the observations already accumulated to such form as to render them available for the objects of science.

This was agreed to, and the following gentlemen were accordingly appointed Members of the Sub-committee:—The Honorable the President; Capt. Barker; the Rev. W. K. Fletcher, M.A.; G. C. M. Birdwood Esq., M.D.; J. Burgess, Esq.; Venayekrao Jugonnathjee, Esq.; and the Secretary.

After some further conversation the Meeting adjourned to Thursday the 19th instant.

SESSION 1863-64.

THIRD MEETING.—*November 19th*, 1863.

THE Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday the 19th instant, at half-past 4 P. M.

Present.—Captain W. C. Barker, *Vice-President*, in the Chair; G. C. M. Birdwood, Esq., M.D.; J. Burgess, Esq., *F.E.I.S.*; Com-

mander G. T. Robinson ; R. Haines, Esq., B.M. ; the Rev. W. K. Fletcher, M.A ; the Honorable Jugonnathjee Sunkersett ; Homejee Cursetjee Dady, Esq. ; Major J. T. Annesley ; R. S. Sinclair, Esq., LL.D., *Members* ; and D. J. Kennelly, Esq., *F.R.G.S.*, *Secretary*.

The Minutes of the last Meeting were read and confirmed.

Election.—H. H. Swan, Esq.

Donations.—The following donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors :—

1.—The Expedition of Pedro de Ursua and Lope de Aguirre in search of El Dorado and Omagua in 1860-61. By the Hakluyt Society.

2.—Discovery of Australia by the Portuguese in 1601. By ditto.

3.—Proceedings of the Royal Society, Vol. XII., Nos, 50, 51, and 52. By the Society.

4.—Annual Report of the Geological Survey of India, and of the Museum of Geology for the year 1862-63. By the Bengal Government.

5.—Statistical and Geographical Report of the District of Bancoorha. By the Bombay Government.

Letters read.—The following letters were then read :—

1.—From Messrs. Williams and Norgate, 14, Henrietta Street, London, intimating the receipt from Munich and Vienna of several enclosures directed to the Society, and requesting to remit the expenses incurred on account of the parcel, as also to be informed how to forward the same.

2.—From the Librarian, Trinity College, Dublin, acknowledging with thanks copy of Vol. XVI. of the Society's Transactions.

3.—From Messrs. Smith, Elder, and Co., 65, Cornhill, London, acknowledging the receipt of copies of the Society's Transactions, requesting to be furnished with the addresses of some of the Honorary Members, and offering apology for having by mistake charged the Society with the Periodical "Once a Week."

4.—From George Scott, Esq., Superintendent of Stationery, forwarding two packets of Proceedings from the Royal Society, as also a Bill for the expenses incurred thereon.

5.—From J. Firth, Esq., acknowledging with thanks the Secretary's intimation of his having been elected a Member of the Society, and forwarding his subscription for the year 1863-64.

There being no other business before the Society, conversation on miscellaneous subjects followed, after which the Meeting adjourned to Thursday, December 17th, 1863.

SESSION 1863-64.

FOURTH MEETING.—*January 21st*, 1864.

THE ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 21st instant, at half past 4 P.M.

Present.—R. S. Sinclair, Esq., *LL.D.*, Senior Member, in the Chair; J. Burgess, Esq., *F.E.I.S;* Cursetjee Furdoonjee Paruck, Esq.; Atmaram Pandurang, Esq., *G.G.M.C.;* G. C. M. Birdwood, Esq., *M.D.;* R. Haines, Esq., *M.B.;* and D. J. Kennelly, Esq. *F.R.G.S.*, Secretary.

The Minutes of the last meeting were read and confirmed.

Election.—M. Kane, Esq., *M.D. Members proposed.*—Lieutenant T. C. R. Carpendale; Sorabjee Framjee, Esq.; Dr. Ernst Esselbach; C. R. Markham, Esq., *F.R.G.S.*, and the Rev. H. Lloyd, *D.D.*, *D.C.L.*

Donations.—The following donations were laid before the Society for which their best thanks were directed to be conveyed to the donors:—

1.—Proceedings of the Royal Geographical Society of London, Vol. VII., Nos. II., III., IV., and V. By the Society.

2.—List of the Members, Officers, &c. of the Royal Institution of Great Britain for 1862. By the Royal Institution of Great Britain.

3.—Notices of the Proceedings at the Meetings of the Members of the Royal Institution of Great Britain. By ditto.

4.—Proceedings of the Royal Institution of Great Britain, Vol IV. Nos. 37 and 38. By ditto.

5.—On the Lighting up the Entrance to Bombay Harbour, by Captain W. C. Barker, I.N., with an outline Chart of the Bombay Harbour. By the Author.

6.—Whirlwinds and Dust-storms of India, by Surgeon P. F. H. Baddeley, Bengal Army. By Lieutenant Morris, R. N. R.

7.—Papers relative to the Improvement of the Forest Revenue of the Punch Mahals. By Government.

8.—Report on the subject of the Rain Fall in the Dekhan, and the Climatic Disturbance apparent during 1861 and 1862. By the Director of Public Instruction.

9.—Papers relating to the project of connecting Barsee with the Barsee Railway station by Tramways. By ditto.

10.—Deaths in Bombay during 1862. By the Principal Inspector General Medical Department.

Letters read.—The following letters were read :—

1.—From the Principal Librarian British Museum; Secretary, Geological Society of London; Librarian St. David's College, Wales; Librarian Washington Observatory, acknowledging with thanks copies of Vol. XVI. of the Society's Transactions.

2.—From Captain J. M. Gilliss, Secretary Washington Observatory, acknowledging with thanks Vols. XV. and XVI. of the Society's Transactions, together with a copy of the Catalogue of the Library, and expressing a wish to obtain the earlier volumes of the Transactions either by purchase or in exchange for duplicate publications, of which this Society has no copy in its Library.

3.—From E. I. Howard, Esq., Director of Public Instruction, forwarding donations for the acceptance of this Society.

4.—From W. H. Havelock, Esq., Officiating Secretary to Government, Political Department, forwarding, by direction of the Honorable the Governor in Council, printed copies of two Reports, by Lieutenant Colonel Lewis Pelly, Acting Political Resident in the Persian Gulf and W. H. Warner, Esq., Commanding Residency Schooner "Georgiana."

5.—From J. A. Broun, Esq., *F.R.S.*, Superintendent Trevandrum Observatory, forwarding two Papers to the Society prepared by him.

The Secretary then submitted to the Society the first Paper announced for the evening. It was by Lieutenant Colonel Lewis Pelly, containing an account of his recent journey from Bushire to Shirauz.

The second Paper read was a Report on the Bay and Fort of Shewoo on the shore of the Persian Gulf by H. W. Warner, Esq.

After some remarks of a general nature on the first two Papers which were contributed by Government, the Secretary read the following letter from J. A. Broun, Esq., *F.R.S.*, Superintendent of the Trevandrum Observatory, which formed an introduction to his two important Papers.

To the SECRETARY of the BOMBAY GEOGRAPHICAL SOCIETY.

SIR,

There are a few points connected with conclusions deduced in the volumes of Magnetical and Meteorological Observations made in the Bombay Observatory, of some importance to science, to which it seems to me desirable to allude. As the Bombay Geographical Society seems interested in these works, and as the conclusions referred to are opposed to results long ago obtained by myself, I shall feel obliged if you will communicate the accompanying notes to the proceedings of your Society.

I have the honour to be,

Sir,

Your most obedient Servant,

JOHN ALLAN BROUN.

Observatory, Trevandrum, 1st January 1864.

The Secretary then read Mr. Broun's first Paper "On a supposed effect of the humidity derived from the cistern of the Wet Bulb Thermometer upon the readings of an adjacent dry bulb."

Dr. Haines remarked that the statements now read, if thoroughly substantiated, indicated so great an error, not only in the results deduced from the observations, but in the observations themselves, as materially to shake confidence in the correctness of other observations, which may not have been called in question. The obvious course open

to a physical observer, when a fact of so remarkable a nature as this depression in the temperature of the dry bulb thermometer had been deduced from a comparison of observations not originally directed to this point, would be to establish a special set of experiments, by which, carefully eliminating all possible sources of error, the original conclusion might be either verified or disproved. Until now, often as he had heard this statement of Professor Orlebar quoted, he had always been under the fullest impression that it was given as the result of distinct observations, and not of mere deduction from recorded observations, which as now shown were not even simultaneous. The utmost discouragement ought to be given to such an easy-going and unphilosophical system of deduction.

Mr. Burgess remarked, that he fully agreed with Dr. Haines in thinking it was unphilosophical to found any such deductions as Mr. Orlebar's on old observations, without submitting the question to the test of direct experiment, when it could have been so easily done; but even if this had been otherwise impracticable, he thought it was unscientific to derive any conclusion from the differences of readings of the two instruments in a comparatively small number of isolated cases, occurring in the course of a whole year, and among which differences no sort of consistency existed. He remembered having read somewhere of the effect Professor Orlebar supposed he had discovered; and though suspicions of its value, he had never seen it explained, and was glad to find that Mr. Broun had been able to trace out the somewhat curious origin of the error, and to dispose of it so satisfactorily. This led him to remark, that he thought it strange the Bombay Observatory should have so long persisted in making its observations for the Göttingen day. Had all other observatories continued to do the same, there would have been every reason why it should be employed here also; but this was not the case; and as the Göttingen day does not correspond exactly to the day either farther east or west, if it is employed there is the disadvantage that a number of the hourly observations at the end of the week cannot be compared with others made in neighbouring longitudes,—no observations being made anywhere on the local Sunday.

At the conclusion of these remarks, the Secretary read Mr. Broun's second paper, "On an effect of the Atmosphere upon the Magnetic intensity of the earth supposed to be found in the Bombay Magnetical Observations from 1847 to 1862."

Mr. Burgess said Dr. Haines had remarked on the former paper, that the detection of errors of the kind pointed out by Mr. Broun tended to shake our confidence in the whole of the observations, but this instance seemed a much more remarkable one of the way in which errors had been perpetuated in the observations for no less a period than sixteen years; and though, as Mr. Broun had remarked, we are told in other volumes that in the course of that time the results had been again verified, it was to be looked upon as indicative of a want of independent mind in the conduct of the Observatory, that during this long period the mistake had not been detected. When no similar result had ever since been noticed elsewhere, it was strange that this solitary instance had not been suspected, and the whole question referred to some one competent to deal with it, or that the data were not re-examined with the corrected temperature co-efficient. It seemed still more remarkable, that when the effect was said to have been verified at later dates, the difference of the results arrived at by using a co-efficient of 2·0, instead of the older and more erroneous one of 3·2 small scale divisions, should not have been noted as accounting for a very large proportion of this supposed effect of the surrounding air. Then the consequence of this hypothesis was a serious one, for all the quantities to which it has been applied in these 15 volumes, are vitiated by it as well as by the error Mr. Broun had pointed out in the temperature co-efficient. It was greatly to be regretted that for so long a time the observations had been corrected by a value of this co-efficient, which a rough examination of the observations themselves showed to be inaccurate to the extent of at least a fifth of its amount. It was of importance, he thought, that both the temperature and unit co-efficients should be determined with the utmost possible accuracy before they were applied to the simple readings. The long standing of these mistakes reminded him of another, no less curious, if of much less consequence; he referred to the printed scale-readings of the bifilar magnetometer; by some accident or another, at the commencement the divisions for tens had been read as units and those for units as tenths; and this had been continued ever since—thus the variations appeared to be only one-tenth of the amount at Bombay, which they might be expected. The most cursory inspection of a volume of observations from any other Observatory should have made this patent, yet strange to say it seemed never to have been noticed, and the same mistake was continued from the

first to the last volume. It was not of much consequence when once the explanation was suspected, but it might puzzle one at first to understand why three successive horary readings of the Bombay instrument gave 16·28, 16·33, and 16·37, whilst in another Observatory we meet with such readings as 508·6, 509·0, and 509·7,—the differences being so very much less in the one case than in the other. In conclusion he begged to express the hope that Mr. Broun would find it convenient to add to the favour he had already conferred on the Society, by favouring them as opportunity afforded with other papers of a like kind.

Dr. Sinclair observed that Mr. Broun had laid the Society under deep obligations by sending to them his valuable papers, in which he discussed some of the more salient peculiarities of the observations made in the Bombay Magnetical Observatory, and expressed a hope that they would be given to the press in anticipation of their publication in the Transactions of the Society, that the information they contained, and the points raised in them, might be made known as widely and as early as possible. Dr. Sinclair further stated, that he thought it a matter of regret that a greater number of copies of the Bombay Magnetical and Meteorological Observations had not been distributed. Mr. Broun had observed, in reference to the values of the temperature-co-efficient obtained by his method and by the older method, that the values generally differed, and differed with the instruments employed, with a *single exception*—Dr. Lloyd had informed him, that in the case of the *bifilar* belonging to the *Dublin* University Magnetical Observatory, the difference was found to be *nothing*. This peculiarity of the instrument under Dr. Lloyd deserved particular attention. Of the three illustrious men, Gauss, Lloyd, and Sabine, to whom the world was so much indebted for the great system of magnetical observations, which was steadily advancing the knowledge and theory of terrestrial magnetism, it was to Dr. Lloyd that the designing of the *instrument* (chiefly modifications of the ones planned by Gauss) was entrusted; and the Observatories in various parts of the world—at Toronto, St. Helena, the Cape, Van Dieman's Land, Simla, Madras, and Bombay, were provided with instruments precisely similar to those of the Observatory under Dr. Lloyd, by whom the first directors of these Observatories were taught in Dublin the methods of observation. Possibly it might be to some mode of suspending the Dublin bifilar that the peculiarity mentioned in Mr. Broun's paper is to be attributed. Dr. Sinclair

stated that he had had several interviews with Dr. Lloyd during the last year, with frequent opportunities of taking observations by the very bifilar alluded to by Mr. Broun; and that Dr. Lloyd, in the course of conversation, while expressing a great interest in the Bombay Observatory (which he playfully styled "one of his children"), had brought to his notice, that with the exception of the first volume of the Bombay Magnetical Observations, he had not received any copy himself, and that the library of the Royal Irish Academy (at which learned Society papers on Magnetism were being continually read) was also without a copy of the Bombay Observations. Professor Sinclair said he had promised Dr. Lloyd that he would move the Bombay Geographical Society (which he considered the most fitting channel) when an opportunity offered, to ask Government to present copies of the Bombay Magnetical and Meteorological Observations both to the Royal Irish Academy and to Dr. Lloyd. As Mr. Broun's paper had brought forward the subject, he therefore begged to move the Society to that effect.

Dr. Haines stated that he was of opinion that it would be best for Dr. Sinclair to make a personal application to Government for the copies. This Dr. Sinclair then said he would do.

Cordial votes of thanks were then passed to His Excellency the Governor in Council and to Mr. Broun, and the meeting adjourned to the 18th February.

SESSION 1863 64.

Fifth Meeting.—*February 18th*, 1864.

The Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 18th instant, at half-past 4 P.M.

Present.—The Honorable W. E. Frere, C.S., *F.R.G.S.*, *President*, in the Chair; Captain W. C. Barker, *Vice-President*; J. Burgess, Esq., *F.E.I.S.*; G. C. M. Birdwood, Esq., M.D.; the Rev. W. K. Fletcher, M.A.; the Honorable Jugonnathjee Sunkersett; Sir Jamsetjee Jejeebhoy, Bart., *F.R.G.S.*; Thomas Black, Esq. Atmaram Pandurang, Esq., *G.G.M.C.*; R. S. Sinclair, Esq., LL.D., *Members*; and D. J. Kennelly, Esq., *F.R.G.S. Secretary*.

The Minutes of the last Meeting were read and confirmed.

Elections.—James Taylor, Esq., Lieutenant T. C. R. Carpendale, and Sorabjee Framjee, Esq.

Donations.—The undermentioned donations were then laid before the Society, for which their best thanks were directed to be conveyed to the donors :—

1.—Proceedings of the Royal Society, Vol. XII., Nos. 53 and 54. By the Society.

2.—Report on the subject of the Rain-fall in the Dekhan and the Climatic Disturbance apparent during 1861 and 1862. By Government.

3.—Papers relating to the Project of connecting Barsee with the Barsee Railway Station by Tramways. By Government.

4.—Memoirs of the Geological Survey of India. By the Bengal Government.

Letters read.—The following letters were read :—

1.—From Captain E. B. Holland, R. E., Under-Secretary to Government, Public Works Department, forwarding donations to the Society, and the following from Cursetjee Furdoonjee Paruck, Esq., addressed to the President :—

To the Honorable W. E. FRERE, Esq., *F.R.G.S.*,
President of the Bombay Geographical Society.

SIR,

Observing that the Library of our Geographical Society is very deficient in many standard Geographical works, I have the pleasure of conveying through you the expression of my willingness to appropriate the sum of Rupees fifteen hundred (1,500) for the purchase of Books for the Library of the Bombay Geographical Society. These books to be selected by yourself and the Secretary to the Society, along with any Member of the Committee with whom you may desire to associate yourselves for this purpose.

I have the honour to be, &c.

CURSETJEE FURDOONJEE PARUCK.

Bombay, 22nd January 1864.

This letter, in anticipation of the wishes of the Society, received the immediate personal acknowledgment of the President.

Resolved unanimously.

That in accepting Mr. Cursetjee Furdoonjee's munificent gift of Rs. 1,500 for the purchase of Books for the Society's Library, he be requested to accept the expression of their grateful appreciation of his kindness, and of their warmest thanks for his handsome present.

It was also unanimously resolved, that the following letter be addressed to Mr. Cursetjee Furdoonjee in the name of the Society :—

To CURSETJEE FURDOONJEE PARUCK, Esq.,

&c. &c. &c.

Bombay.

SIR,

I have the honor, by direction of the Bombay Geographical Society, to request you will accept the expression of their gratetul appreciation of your kindness in presenting them with the sum of Rs. 1,500, one thousand and five hundred, for the purchase of standard Geographical works for their Library, and of their warmest thanks for your handsome present.

2. I am further desired to state that the Society will, at an early date, avail themselves of your munificent benefaction, and that the Works, purchased with the money you have so liberally placed at their disposal, will have one uniform binding, and have a plate in them with the following inscription :—

Geographical Society, Bombay.
THE PRESENT OF
Cursetjee Furdoonjee Paruck, Esq.,
22nd January 1864.

I have the honour to be, &c.

D. J. KENNELLY,
Secretary to the Society.

Bombay, 24th Februarg 1864.

Dr. Birdwood, in proposing Mr. C. R. Markham as an Honorary Member of the Society, said he did so on the ground of his being a scientific traveller, who had published works on his travels of acknowledged value; he had also introduced the quinine-bearing cinchonas into India, and was Honorary Secretary to the Hakluyt and Royal Geographical Societies. He could assure the meeting that Mr. Markham would highly appreciate the honour of being elected Honorary Member of this Society.

Mr. Markham was then ballotted for and declared unanimously elected as an Honorary Member of the Society.

Dr. Sinclair, in proposing the Reverend Humphrey Lloyd, D.D., D.C.L., &c. as an Honorary Member of the Society, said that he considered Dr. Lloyd's eminent services to physical science, and more especially his labours in advancing the theory of magnetism, and in improving the methods of Magnetical and Meteorological Observations —branches of science connected, not remotely, with the objects of the Geographical Society—were worthy of the Society's best recognition. As to whether the offer of the Honorary Membership of the Society would be acceptable to Dr. Lloyd, Professor Sinclair stated that he was sure, from the interest Dr. Lloyd took in the objects of the Society, that he would feel much gratified by this distinguished mark of the Society's appreciation of his services to science.

The Rev. Dr. Lloyd was then ballotted for and declared unanimously elected to an Honorary Membership of the Society, after which the Meeting adjourned to Thursday, March 17th, 1864.

SESSION 1863-64.

Sixth Meeting, *March 17th*, 1864.

The Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 17th instant, at half-past 4 P. M.

Present.—Captain W. C. Barker, *Vice-President*, in the Chair; Bhau Daji, Esq, *G.G.M.C.*; J. Burgess, Esq., *F.E.I.S.*; Sir Jamsetjee Jejeebhoy, Bart., *F.R.G.S.*; the Honorable Juggonath Sunkersett; Homejee Cursetjee Dady, Esq.; Atmaram Pandurang Esq., *G.G.M.C.*,

Munguldass Nuthoobhoy, Esq., *Members,* and D. J. Kennelly, Esq., *F.R.G.S., Secretary.*

The Minutes of the last Meeting were read and confirmed.

Members proposed.—Alfred Brasher, Esq., and James Scorgie, Esq., *F.C.S.*

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1.—Classified Catalogue of the Books of the Library of the Bombay Branch of the Royal Asiatic Society. By the Society.

2.—Report of the Bombay Chamber of Commerce for the year 1862-63. By the Bombay Chamber of Commerce.

Letters read.—The following letters were read:—

1.—From J. Burgess, Esq., proposing J. Scorgie, Esq., *F.C.S.*, as a Member of the Society.

2.—From Commander G. T. Robinson, expressing his regret at his inability to attend the meeting of the Committee, and requesting to record his vote for Mr. Brasher.

The Secretary then read the first paper announced for the evening. It was by A. W. Stiffe, late Lieutenant H. M.'s Indian Navy, Assoc. Inst. C. E., *F.R.A.S.*, containing an account of a Cyclone experienced by the Government of India Steam Ship "Amberwitch" near the Mauritius, January 1864.

The Secretary, after some general remarks on this Paper, submitted to the Society Lieutenant Stiffe's second Paper "Report on the Line of Telegraph from Ras Jashk to Basrah."

The Meeting then closed with a vote of thanks to Lieutenant Stiffe, and adjourned to Thursday, April 21st, 1864.

SESSION 1863-64.

Seventh Meeting, *April 21st*, 1864.

The Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 21st instant, at half-past 4 P. M.

Present.—The Honorable W. E. Frere, C. S., *F.R.G.S., President*, in the Chair; J. Burgess, Esq.; Commander G. T. Robinson; T. Black, Esq.; R. Haines, Esq., M.B.; James Taylor, Esq.; R. S. Sinclair, Esq., LL.D., Venayekrow Jugonnathjee, Esq.; J. Firth, Esq., *Members*: and D. J. Kennelly, Esq., *F.R.G.S., F.R.A.S., Secretary.*

The Minutes of the last Meeting were read and confirmed.

Members proposed.—A. C. Gumpert, Esq.; R. J. Pringle, Esq.; Colonel J. Jones, R.E.; Lieutenant W. P. Arnot; Lieutenant H. Burnes; and E. S. Dawes, Esq.

Elections.—Alfred Brasher, Esq.; James Scorgie, Esq., *F.C.S.*; and Bhugwandass Purshotumdass, Esq.

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors.

1.—Journal of the Royal Geographical Society of London, Vol. XXXII. By the Society.

2.—Proceedings of the Royal Society of London, Vol. XII., Nos. 55 and 56. By the Society.

3.—Morgan's British Trade Journal and Export Price Current. By the Author.

4.—Bulletin de la Société de Géographie, Cinquième série, Tome VI. By the Geographical Society of Paris.

5.—Jahrbuch der Kaiserlich-Königlichen Geologischen Reichsanstal. 1861 and 1862. Band XII. By the Geological Society of Munich and Vienna.

6.—Coup d'Œil Historique sur la Projection des Cartes de Géographie. By Monsieur M. D'Avezac.

7.—Synopsis of the Vegetable Products of Norway. By Dr. F. C. Schübeler, Christiania.

8.—Det Kongelige Frederiks Universitets Halvhundredaars. Fest Sept. 1861. Christiania.

9.—Det Kongelige Korste Frederiks Universitets, Aursberetning, 1861, Christiania.

10.—Goidemaatinger Korge, 1860. Christiania.

11.—Die Altnorwegische Landwirthschaft, by Dr. F. C. Schübeler. Christiania.

12.—Maps—Ethnographisk Kart over Finmarken, 1861. 5 sheets, Christiania.

Letters read ;—

1. From the Secretary to the Royal Geographical Society of London, forwarding Vol. 32 of the Journal for the Society's acceptance.

2. From Messrs. Trübner and Co., 60, Paternoster Row, London, requesting to be appointed the Society's agents in London, and promising to distribute, without cost to the Society, such copies of the Transactions as are intended for Institutions in England and on the Continent.

3. From Captain C. Dodd, Deputy Collector, Sind, forwarding a Paper—"An Island rising out of the Sea," drawn up by himself from a MSS. in his possession.

4. From C. Gonne, Esq., Officiating Secretary to Government Political Department, forwarding extracts from a letter from Lieutenant Colonel Lewis Pelly, Acting Political Resident, Persian Gulf, submitting certain remarks on the Port of Lingah, the Island of Kishm, and the Port of Bunder Abbass and its neighbourhood.

The first Paper announced for the evening was by J. Burgess, Esq. *F.E.I.S.*, who having been called upon by the Honorable the President, prefaced by saying that by a coincidence the Paper he was now about to read to the Society, had, under nearly a similar form, met his eye since entering the room, in one of the scientific periodicals received by the last Mail. The Paper, he went on to say, formed a sequence of what had appeared from his pen a few years ago in the Philosophical Journal, and although he had immediately after nearly worked out what he was now about to place before the Society, yet from want of opportunity he had allowed his Paper to stand over until completed for the Society a few days before.

At the conclusion of Mr. Burgess' Paper, and after some considerable discussion, in which the Honorable the President and several of the Members present took an active part, the Secretary was called upon to read the second Paper of the evening. This Paper was drawn up by Captain C. Dodd, Deputy Collector, Sind, and contained an account of an Island rising out of the Sea.

At the conclusion of Captain Dodd's Paper, the Honorable the President said he had a distinct recollection of the circumstances narrated in the Paper just read to the Society, having been brought to his notice by the late Captain Frere, R.N., then returned from the Mediterranean, and he had no hesitation in concluding, from the dates and similarity of both accounts, that Graham Island must have been the volcanic upheaval witnessed under Captain Dodd's communication, and which about the same time had been reported on by Captain Swinburne of H. M.'s Ship "Rapid," and communicated to the Royal Geographical Society, *vide* their Journal 1831-32.

Captain Black added a similar testimony from personal knowledge.

The third Paper read by the Secretary was contributed by the Government. It was by Lieutenant Colonel Lewis Pelly, Acting Political Resident in the Persian Gulf, submitting certain remarks on the Port of Lingah, the Island of Kishm, and the Port of Bunder Abbass and its neighbourhood. At its conclusion a vote of the Society's warmest thanks was passed to Mr. Burgess, Captain Dodd, and His Excellency the Governor in Council, for their very valuable and interesting communications. The Meeting then adjourned to Thursday, May 19th, 1864.

SESSION 1864-65.

Annual Meeting, *May 19th*, 1864.

The Annual General Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday, the 19th instant, at half past 4 P. M.

Present.—The Honorable W. E. Frere, C. S., *F.R.G.S.*, President, in the Chair; Commander G. T. Robinson; the Rev. W. K. Fletcher. M.A.; the Honorable Jugonnathjee Sunkersett; Burjorjee Sorabjee Ashburner, Esq.; M. Kane, Esq., M.D; James Taylor, Esq., *Members:* and D. J. Kennelly, Esq., *F.R.A.S., F.R.G.S., Secretary.*

The Minutes of the last Meeting were read and confirmed.

Elections.—A. C. Gumpert, Esq.; R. J. Pringle, Esq.; E. S. Dawes, Esq.; Colonel J. Jones, R. E.; Lieutenant W. P. Arnott; and Lieutenant H. Burnes. John Connon, Esq., M.A., was admitted under Rule XXII. of the Society.

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1.—Proceedings of the Royal Geographical Society of London, Vol. VIII., Nos. I. and II. By the Society.

2.—Jahrbuch der Kaiserlich Koniglichen Geologischen Reichsantalt 1863. Band XIII. By the Geological Society of Munich and Vienna.

3.—Memoirs of the Geological Survey of India. By the Bengal Government.

Letters read:—

1.—From Captain J. F. Jones and W. F. Hunter, Esq., withdrawing from the Society.

2.—From J.Firth,Esq., Superintendent, Bombay Education Society's Press, informing the Secretary that Rs. 1,800 would be the cost for re-printing Volume VI. of the Society's Transactions.

3.—From the Honorable H. L. Anderson, Chief Secretary to Government, Political Department, forwarding Colonel Playfair's Report.

The Secretary then read the following Paper contributed by Government—

Report on the Result of the Observations and Inquiries made during a Tour in the various Countries around Zanzibar, especially those more or less connected with the Slave Trade, by Lieut. Col. R. L. Playfair, Consul and Political Agent at Zanzibar; for which interesting Paper the warmest thanks of the Society were voted to His Excellency in Council.

The business of the Monthly Meeting having been concluded, the Minutes of the last Annual Meeting were read.

The Voting Lists having been examined, the following, in order of votes, were declared the Office-bearers for the ensuing year:—

Vice-Presidents.

1. His Excellency General Sir W. R. Mansfield, K.C.B.
2. Captain W. C. Barker.
3. Thomas Black, Esq.

Resident Members of the Committee.

1. Sir Jamsetjee Jeejeebhoy, Bart., *F.R.G.S.*
2. Bhau Daji, Esq., *G.G.M.C.*
3. G. C. M. Birdwood, Esq., M.D.
4. R. Haines, Esq., M.D.
5. The Rev. W. K. Fletcher, M.A.
6. J. Burgess, Esq., *F.E.I.S.*
7. The Honorable Jugonnathjee Sunkersett.
8. Commander G. T. Robinson.
9. Sir Alexander Grant, Bart., M.A.
10. A. H. Leith, Esq., M.D.
11. R. S. Sinclair, Esq., LL.D.
12. Venayekrao Jugonnathjee, Esq.

Non-resident Members of the Committee.

1. General G. LeGrand Jacob, C.B.
2. The Honorable H. L. Anderson, C.S.
3. J. M. Erskine, Esq., C.S.
4. Dr. H. D. Glasse.
5. T. C. Hope, Esq., C.S.
6. Dadabhoy Nowrojee, Esq.
7. Dr. J. H. Sylvester.
8. Lieut.-Col. A. B. Kemball, C.B., *F.R.G.S.*

The Secretary, according to custom, placed before the Society the following brief summary of the proceedings of the session:—

At the last Annual Meeting the Society congratulated itself and recorded with pleasure that the session then closing had been, in Papers contributed to its Transactions, more fruitful than during any former similar period of its existence.

It was, therefore, again matter for the Society's congratulation that the same measure of success had attended the various meetings of the session ending that day. While the Papers contributed have not lost in interest or in scientific value, but had merited the approbation of the Society, they exceeded the number read during the past session, and are the following:—

1. Method of computing the times of the Moon's Rising, Setting, and Southing, by J. Burgess, Esq., *F.E.I.S.* Presented by the

author and read before the Society at their First Meeting, September 17th, 1863.

2. On the Tribes, Trade, and Resources around the shore line of the Persian Gulf, by Lieut. Col. Lewis Pelly. Presented by Government, and read before the Society at the same Meeting.

3. Account of a recent Tour round the Northern portion of the Persian Gulf, by Lieut. Col. Lewis Pelly. Contributed by Government, and read before the Society at the same Meeting.

4. Remarks on a recent journey from Bushire to Shiraz, by Lieut. Col. Lewis Pelly. Presented by Government, and read before the Society at their Fourth Meeting, January 21st, 1864.

5. Report on the Bay and Fort of Shewoo on the Shore of the Persian Gulf, by H. W. Warner, Esq., Commanding Residency Schooner *Georgiana*. Contributed by Government, and read before the Society at the same Meeting.

6. On a supposed effect of the Humidity derived from the Cistern of the Wet Bulb Thermometer upon the readings of an adjacent Dry Bulb, by J. A. Broun, Esq., *F.R.S.* Presented by the author and read before the Society at the same Meeting.

7. On an effect of the Atmosphere upon the Magnetic Intensity of the Earth supposed to be found in the Bombay Magnetical Observations from 1847 to 1862, by J. A. Broun, Esq., *F.R.S.* Presented by the author and read before the Society at the same Meeting.

8. Account of a Cyclone experienced by the Government of India Steam Ship *Amberwitch*, near the Mauritius, January 1864, by Lieut. A. W. Stiffe, Assoc. Inst. C.E., *F.R.A.S.* Presented by the Author and read before the Society at their Sixth Meeting, March 17th, 1864.

9. Report on the line of Telegraph from Ras Jaskh to Basrah, by Lieut. A. W. Stiffe, Assoc. Inst. C. E., *F.R.A.S.* Presented by the author and read before the Society at the same Meeting.

10. On the Barometrical Measurement of Altitudes without the use of Logarithms, by J. Burgess, Esq., *F.E.I.S.* Presented by the author and read before the Society at their Seventh Meeting, April 21st, 1864.

11. An Island rising out of the sea, by Capt. C. Dodd. Presented by the author and read before the Society at the same Meeting.

12. Remarks on the Port of Lingah, the Island of Kishm, and the Port of Bunder Abbass and its neighbourhood, by Lieut. Col. Lewis Pelly. Contributed by Government and read before the Society at the same Meeting.

13. Report on the result of the observations and enquiries made during a Tour in the various countries around Zanzibar, especially those more or less connected with the Slave Trade, by Lieut. Col. R. L. Playfair. Presented by Government and read before the Society at their Annual Meeting, May 19th, 1864.

The Society has on its list to-day 105 members.

The number admitted during the session is 23, but against this four have resigned membership, while there have returned to Europe or otherwise left India 8, in all a loss of 22 members. Mr. C. R. Markham and the Rev. Dr. Humphry Lloyd have been admitted to Honorary Membership. A most pleasurable feature in the whole is, that we are not called upon to deplore the loss by death of any one member.

In Captain Felix Jones, late I. N., returning to Europe, and long so well known as Political Resident in the Persian Gulf, we lose one of our oldest members, and one who for many years as a Non-Resident Member of Committee, the Society has deservedly held in very great esteem. As a Marine Surveyor his labours are found in many of the Maritime Surveys undertaken in the Eastern Seas since 1834, and at a late period in the surveys of Mesopotamia. The contributions from his pen are the following, which will be found respectively in the 8th, 9th, 10th, and 12th Volumes of the Society's Transactions :—

1. Narrative of a Journey through parts of Persia and Kurdistan, undertaken in company with Major Rawlinson, Political Agent in Turkish Arabia, dated Baghdad, 31st December 1847. Presented by Government.

2. Preliminary Remarks on the Nahrwan Canal, with a glance at the past history of its province.

3. Researches in the vicinity of the Median wall of Xenophon, and along the old course of the river Tigris.

4. Brief Observations, forming an Appendix to the Map of Baghdad.

From Lieut. T. M. Philbrick, late I. N., who entered the Society in 1860, we have an interesting paper "Notes on the Andamans," found in our 15th Volume.

From Captain W. B. Selby, late I. N., so well known as an accomplished Hydrographer, we have in our 12th Volume "The Survey of the Malabar Coast."

From Commander E. F. T. Fergusson, late I. N., and lately in charge of the Bombay Observatory, "On the Dimensions and Track of a Cyclone experienced at Bombay in November 1862."

From Captain H. A. Fraser, late I. N., "On the Capabilities of the River 'Juba' for Navigation."

And finally from Assistant Surgeon W. H. Bradley, contained in our 7th Volume:—

1. Some Account of the Topography and Climate of Chikuldah situated on the Table-land of the Gawil Range.

2. Desultory Observations on the probable origin of the Ghonds, with a Vocabulary of the Dialect spoken by the Ghond Tribes upon the Gawil Hills.

Among the many donations received by the Society during the past year, the munificent gift of Rs. 1,500, presented by Mr. Cursetjee Furdoonjee Paruck, for the purpose of extending the Library, takes the foremost place. It is hoped the books selected by the Committee agreeably to the donor's wishes will be received during the early part of the next session, when it is trusted the Society will be in possession of a room larger and more suitable to their purposes than that they now occupy.

The promised MS. Catalogue of the Society's Charts, Maps, Sketches, and Views is presented to the Society to-day, and I take this opportunity of testifying to the worth and industry of the Society's Clerk, Mr. Balvant Krishnaráo Pálekar, who has materially assisted me in its production.

The Annual Statement of Receipts and Disbursements on account of the Society, from 1st May 1863 to 30th April 1864, submitted to the Society, showed the following balance to their credit:—

Balance with the Treasurers and Secretary, as per balance sheet..... Rs.	2,541	15	3
Add—			
Subscriptions under recovery	1,020	0	0
Total Rupees	3,561	15	3
Deduct—			
Mr. Cursetjee Furdoonjee Paruck's donation for the purchase of standard geographical works..... Rs.	1,500	0	0
Balance Rupees	2,061	15	3

A vote of the Society's warmest thanks having been unanimously passed to the Honorable the President, to the Secretary, and to the Office bearers of the past year, Mr. Kennelly in a few words gave in his resignation of the Honorary Secretaryship, owing to official labour, which, he said, prevented him from devoting the time necessary to the due performance of his duty to the Society. It was finally settled that Mr. Kennelly would continue to hold the office until the appointment of his successor, and the Meeting adjourned to the following September.

SESSION 1864-65.

FIRST MEETING.—*September 15th*, 1864.

THE Ordinary Monthly Meeting of the Bombay Geographical Society was held in their new room, on the basement storey of the Town Hall, on Thursday, the 15th instant, at half-past 4 P. M.

Present.—Manockjee Cursetjee, Esq., *F.R.G.S.*, Senior Member, in the chair; G. C. M. Birdwood, Esq., *M.D.*; R. S. Sinclair, Esq., *LL.D.*; J. Scorgie, Esq., *F.C.S.*; J. Burgess, Esq., *F.E.I.S.*; Atmaram Pandurang, Esq., *G.G.M.C*; Bhugwandas Purshotumdas, Esq.; Commander G. T. Robinson; E. S. Dawes, Esq., *Members*: and D. J. Kennelly, Esq., *F.R.A.S.*, *F.R.G.S.*, *Secretary*.

The Minutes of the last Meeting were read and confirmed.

Election.—The Rev. F. Gell, M.A.

Members proposed.—Cornet T. J. Newnham and F. A. R. Morrison, Esq.

Donations.—The undermentioned donations were placed before the Society, for which their best thanks were directed to be conveyed to the donors :—

1.—Proceedings of the Royal Society of London, Vol. XII., No. 57. By the Society.

2. Catalogue Raisonne of Rare, Valuable, and Curious Books, for April, May, and July 1864. By Bernard Quaritch, Esq.

3. Prabhu Rupee Calendar and Directory for the year of Shalivahan, 1786 (A. D. 1864-65). By the Society for the Publication of the Calendar.

4. Report on Vaccination throughout the Bombay Presidency and Sind for 1863. By the Principal Inspector General, Medical Department.

5. Papers relative to the Introduction of Revised Rates of Assessment into the Hoongoond and part of the Uthnee Talookas of the Yadwar Mahal of the Gokak Talooka of the Belgaum Collectorate. By Government.

6. Memoirs of the Geological Survey of India, Vol. III., Part 2, and Vol. IV. Part 2. By the Bengal Government.

7. Greenwich Magnetical and Meteorological Observations for 1861. By the Royal Observatory, Greenwich.

Letters read.—The following letters were read :—

1. From the Rev. Dr. Humphry Lloyd, Cambridge Observatory acknowledging with thanks the Secretary's letter intimating his election as an Honorary Member of the Society.

2. From His Excellency Lieut. General. Sir W. R. Mansfield. *K.C.B.*, acknowledging with thanks the Secretary's letter announcing his re-election as a *Vice-President* for 1864-65.

3. From Sir Jamsetjee Jejeebhoy, Bart., acknowledging with thanks the intimation of his having been re-elected a Resident Member of the Committee.

4. From Cornet T. J. Newnham, Inniskilling Dragoons, Poona, requesting to be elected a Member of the Society.

5. From Messrs. Smith, Elder, & Co., London, acknowledging a remittance, and informing the Secretary of their having forwarded the

Transactions, intended for the Honorary Members, to the Secretary of the Royal Geographical Society of London.

6. From G. Scott, Esq., Superintendent of Stationery, forwarding a packet received from the Royal Society of London.

7. From the Honorable H. L. Anderson, Chief Secretary to Government, Political Department, informing the Society that the occupation of a new room, referred to by them in their letter, has been sanctioned by Government.

8. From T. D. Thomson, Esq., London, acknowledging a remittance of £50 with an order for books, and promising to advise the Society as soon as the books shall be despatched. And the following, which relates to the Colaba Observatory:—

"To the SECRETARY GEOGRAPHICAL SOCIETY, Bombay.

SIR—Dr. Leith, in his late report on the Sanitary Condition of Bombay, mentions that he has been obliged to take the table showing the number of days on which the wind blew from each point from the Meteorological Report for the year 1850, because Osler's Wind Gauge at the Observatory at Colaba cannot now be depended upon.

In consequence of this, the Government desire to enquire into the state of the Observatory at Colaba, and I am desired to ask the favour of your Society naming any persons specially qualified to serve on a committee for such inquiry.

I have the honour to be, &c.,
W. F. MARRIOTT, Lieut. Colonel,
Secretary to Government.

Bombay Castle, 6th June 1864."

The Acting Secretary then read the following Paper contributed by Government:—

Visit to the Wanika Country in the vicinity of Mombassa, and the progress made by the Christian Missionaries at that place, by Lieut-Colonel R. L. Playfair, H.M.'s Consul and Political Agent at Zanzibar.

At the conclusion of this Paper the Chairman and several of the Members present having offered some observations on the interesting incidents touched upon by Colonel Playfair, the second paper announced for the evening was then submitted to the Society. It was an

extract from the Administration Report of the Political Agent at Zanzibar, for the two past years ending with 31st May 1864.

The warmest thanks of the Society were then unanimously voted to His Excellency the Governor in Council for the two interesting communications, and to the several donors for their valuable presents to the Library, and the Meeting adjourned to Thursday, October 20th, 1864.

SESSION 1864-65.

SECOND MEETING, *October 20th*, 1864.

THE Ordinary Monthly Meeting of the Bombay Geographical Society was held in their new room, on the basement storey of the Town Hall, on Thursday, the 20th instant, at half-past 4 P. M.

Present.—Captain W. C. Barker, *Vice-President*, in the Chair; the Rev. W. K. Fletcher. M.A.; J. Burgess, Esq., *F.E.I.S*; G. C. M. Birdwood, Esq., M.D.; Atmaram Pandurang, Esq., *G.G.M.C.*; Venayekrow Jugonnathjee, Esq.; A. C. Gumpert, Esq.; M. Kane, Esq., M.D., *Members:* and D. J. Kennelly, Esq., *F.R.A.S.*, *F.R.G.S.*, Acting Secretary.

The Minutes of the last Meeting were read and confirmed.

Elections.—Cornet T. J. Newnham and Frank A. R. Morrison, Esq.

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1. Proceedings of the Royal Geographical Society of London, Vol. VIII., Nos. III. and IV. By the Society.

2. Papers relative to the Introduction of Revised Rates of Assessment into the Hoongond and part of the Uthnee Talookas, and the Yadwar Mahal of the Gokak Talooka, all of the Belgaum Collectorate. By Government.

3. Geographical, Statistical, and General Report on the District of Hazareebaugh, surveyed during seasons 1858-59 to 1862-63. By Government.

Letters read.—The following letters were then read :—

1. From T. D. Thomson, Esq., London, transmitting an Invoice of the first batch of books ordered by the Society on account of the Cursetjee Furdoonjee Paruck's presentation.

At this stage of the proceedings, the members present took a cursory view of the new books placed on the table for their inspection, and requested the Secretary to convey to Mr. Thomson the expression of their warmest thanks for the handsome style in which the books were bound.

2. From Secretary Lieutenant Colonel W. F. Marriott, forwarding the following copy of a letter reporting the occurrence of an Earthquake at Guadur :—

No. 622 of 1864.

Indo-European Telegraph Department.

From the Director Mekran Coast and Sub-Marine Telegraph,
To the Secretary to Government, Bombay.

Kurrachee, 27th August 1864.

Sir,—I have the honour to forward, for the information of Government, copies of two telegrams received by me from Guadur reporting the occurrence there of a smart shock of Earthquake at a quarter to one o'clock on the morning of the 25th instant.

2. Since I have become acquainted with the Mekran Coast, no previous shock of Earthquake has been felt, but that violent convulsions have taken place at different times, is apparent from the face of the country. In many places masses of rock are thrown up into a mound as though a mine had been sprung immediately below. In several places mud volcanoes vomit forth liquid mud ; and it is worthy of remark, that these volcanoes are evidently influenced by the action of the tide, although they are in some instances ten or twelve miles from the sea. At spring tides the mud, which is quite cold, bubbles up unusually high and is accompanied with a rumbling sound which can be heard at some distance off. The highest of the volcanoes that have come under my notice, was about three hundred and fifty feet above the level of the surrounding country, and about seven miles from the sea.

3. As the entire coast of Mekran is volcanic, I often enquired of the Beloochees regarding the occurrence of Earthquakes, and the only

phenomenon of this sort, of which I could obtain any information, was said to have happened about one hundred years ago, when, as my informant assured me, an entire hill, with men and camels on it, disappeared into the sea. I imagine this must have been a landslip caused by some sub-marine disturbance. The spot was pointed out to me, and is known by the name Ras Koocheree on the chart.

4. On one occasion, about twelve months ago, when coming into Kurrachee from Guadur in the gun-boat *Clyde*, we passed through many miles of sea literally covered with bodies of dead fish of every size and description. At the time I felt confident that these fish had been destroyed by some sub-marine volcano emitting noxious and deadly gases, for there was a most unpleasant smell and a large emission of gas from the mud volcanoes on shore. But these are circumstances on which I can merely venture to offer an opinion. One practical conclusion, however, would appear to suggest itself, namely, that the unsettled state of the crust of the earth along this coast, and which I believe extends far out to sea, may have some bearing on the security of the cable.

I have the honour to be, &c,
H. I. WALTON, Director,
Mekran Coast and Sub-Marine Telegraph.

The Acting Secretary then read his Paper, "Notes on the recent Earthquake in the North-western part of the Bombay Presidency" announced for the evening, and illustrated the incidents touched upon therein by several beautiful photographs, and a drawing specially prepared for the occasion. At its conclusion the Chairman dwelt for some time on the merits of the Paper, and moved that the best thanks of the Society be awarded to the Secretary for the interesting Paper he had drawn. This proposition having been cordially seconded by Dr. Birdwood, was unanimously carried, and the Meeting adjourned to Thursday, November 17th, 1864.

SESSION 1864-65.

THIRD MEETING, *November 17th*, 1864.

THE Ordinary Monthly Meeting of the Bombay Geographical Society was held in their new rooms, on the basement storey of the Town Hall, on Thursday, the 17th instant, at half-past 4 P. M.

Present.—Thomas Black, Esq., *Vice-President*, in the Chair; J. Burgess, Esq., *F.E.I.S*; R. S. Sinclair, Esq., LL.D; J. Firth, Esq.; J. Scorgie, Esq., *F.C.S.*; the Rev. W. K. Fletcher, M.A. *Members*: and D. J. Kennelly, Esq., *F.R.A.S.*, *F.R.G.S.*, *Acting Secretary*.

The Minutes of the last Meeting were read and confirmed.

Elections.—Brigadier General T. Tapp, C.B.; Surgeon Major S. M. Pelly, *F.R.C.S*; Surgeon Major T. W. Ward, *F.R.C.S.*, and F. King, Esq.

Members proposed.—Premchund Roychund, Esq., F. H. Souter, Esq., Captain Van-Heythuysen; Lieutenant W. T. Crockett, and Captain A. Phillips.

Donations.—The undermentioned donations were laid before the Society, for which their best thanks were directed to be conveyed to the donors:—

1.—Report of the Students' Literary and Scientific Society, and of the Vernacular Branch Societies, together with the Report of the Girls' Schools for the session of 1863-64.

2.—Report of the Agri-Horticultural Society of Western India for the year 1863. By the Society.

Letters read:—

1. From T. D. Thomson, Esq., London, furnishing the Society with a list of such books as are obtainable, and requesting their instructions for his guidance.

There being no other business before the Society, the Meeting adjourned to Thursday, December 15th, 1864.

SESSION 1864-65.

FOURTH MEETING, *December 15th*, 1864.

THE Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms on the basement storey of the Town Hall, on Thursday, the 15th instant, at half past 4 P.M.

Present.—The Honorable W. E. Frere, C. S., *F.R.G.S.*, President, in the chair; Captain T. Black, Vice-President; J. E. C. Price, Esq.; Rev. W. K. Fletcher, M.A.; G. C. M. Birdwood, Esq., M.D.; M. Kane, Esq., M.D.; Surgeon Major S. M. Pelly, *F.R.C.S.*; Commander G. T. Robinson; *Members*; and D. J. Kennelly, Esq., *F.R.G.S.*, Secretary.

The Minutes of the last Meeting were read and confirmed.

Elections.—Mirza Ali Jan, Esq.; Dr. W. Niven; T. C. Haylar, Esq.; Premchund Roychund, Esq.; T. H. Souter, Esq.; Captain Van-Heythuysen; Lieut. W. T. Crockett; Captain A Phillips.

Members proposed.—H. Cleveland, Esq.; H. Coke, Esq., M. A.; C. Leggett, Esq.; J. Macfarlane, Esq.; A. Taylor, Esq.; Captain J. A. Fuller, R. E.; Lieut. Colonel A. M. Murray, R. A.; Dinshaw Manockjee Petit, Esq.

His Excellency Rear Admiral G. St. Vincent King, C. B., was, on the motion of the Honorable the President, unanimously elected a Member of the Society.

Donations.—The undermentioned donations were then laid before the Society, for which their best thanks were directed to be conveyed to the donors.

1—Proceedings of the Royal Geographical Society of London, Vol. VIII., Nos 4 and 5. By the Society.

2—Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. I., Part I. By the Society.

3—Prigionieri Italiani a Bocara Lettera del Signor Modesto Gavazzi al Commedatore Christofaro Negri.

The following letter was read:—

1.—From Mirza Ali Jan, Esq., requesting to be admitted a Member of the Society under Rule XXII.

Paper.—The Secretary then read the following paper, contributed by Government.

Report on Dhur Yaroo in the Shikarpoor Collectorate, by Assistant Surgeon J. Lalor, B. A.

At the conclusion of this paper Dr. Pelly stated that "the Salvadore Persica" or Pelor Tree, is the one from which wood is chiefly, if not entirely, obtained for making the lacquered boxes known as Hydrabad or Sind work. The Pelor tree is also a favourite food of camels. Water in the neighbourhood of the place described by Dr. Lalor is at first sight altogether wanting, but as in the beds of nullahs in Cutchee and other places on the frontier of Sind, is almost always procurable by scratching a hole to the depth of a very few feet in the lower levels of the many ravines which intersect the whole of that part of the country. There are also here and there mineral springs I believe met with."

The Honorable the President, Dr. Birdwood, and several of the Members present having offered some observations on the subject of the paper, the warmest thanks of the Society were unanimously voted to His Excellency the Governor in Council for this interesting communication, and to the donors for their valuable presents to the Library.

The Meeting then adjourned to Thursday, January 19th, 1865.

Annual Statement of Receipts and Disbursements on account of the Bombay Geographical Society, from 1st May 1862 to 30th April 1863.

Dr. *Cr.*

Date.		Amount.	Date.		Amount.
		Rs. a. p.			*Rs. a. p.*
1862.			1863.		
May 1st.	To Balances on this date, viz:—		April 30	By Cash paid to Office Establishment	614 3 8
	In the hands of Treasurers. Rs. 114 6 6		,,	,, Do. for Contingencies, Postage, &c.	190 4 4
	Ditto of the Secretary ,, 185 7 4				
		299 13 10	,,	,, Do. for Printing Circulars, &c.	29 8 0
,,	,, Government Subscription for 12 months.	600 0 0	,,	,, Do. for Binding Books of the Library	93 4 0
,,	,, Annual Subscription from Members, viz:		,,	,, Do. Messrs. Smith, Taylor and Co.'s Invoices	90 6 11
	On account of 1859-60.... Rs. 15 0 0				
	Ditto 1860-61 .... ,, 15 0 0		,,	,, Do. Commission to Messrs. Remington and Co., Treasurers, on payments, Rs. 811-12-0 at 1 per cent ..	8 1 11
	Ditto 1860-62 .... ,, 60 0 0				
	Ditto 1862-63 .... ,, 750 0 0			Rupees....	1,025 12 10
	Ditto 1863-64 .... ,, 570 0 0				
		1,410 0 0			
,,	,, Amount realized by the sale of Philosophical Instruments during the year, viz.				
	,, On acct. of 1 Double Lens Rs. 1 8 0		,,	,, Balance on this date, viz:—	
	Ditto 2 Triple Lens 5 0 0			In the hands of the Treasurers	
	Ditto 1 Pocket Compass 3 0 0			Rs.1,243 11 4	
		9 8 0		Do. do. of the Secretary 95 10 5	
,,	,, Amount realized by the sale of the Society's Transactions during the year.	19 2 0			1,339 5 9
,,	,, Ditto received for a Coir Rug sold....	4 4 0			
,,	,, Interest from Messrs. Remington and Co. Treasurers, at 4 per cent	22 6 9			
	Total Rupees....	2,365 2 7		Total Rupees....	2,365 2 7

Examined, compared with Vouchers, and found correct.

(Signed) J. T. ANNESLEY.
J. BURGESS.

(Errors Excepted.)

(Signed) D. J. KENELLY,
Secretary to the Society.

Annual Statement of Receipts and Disbursements on account of the Bombay Geographical Society, from 1st May 1863 to 30th April 1864.

Date.		Amount.			Date.		Amount.		
		Rs.	a.	p.			Rs.	a.	p.
1863.					1864.				
May 1	To Balance on this date, viz:—				April 30	By Cash paid to Office Establishment	864	0	0
	In the hands of the Treasurers .....Rs. 1,243 11 4				,,	,, Subscription to the "*Times of India*," charges for preparing Indexes to the 16th Volume of Transactions, Contingencies, Postage, &c	207	6	1
	Ditto of the Secretary. ,, 95 10 5								
		1,339	5	9	,,	,, Cash paid for printing 300 copies of Volume XVI. of the Society's Transactions, Circulars, &c	914	0	0
,,	,, Amount received from Cursetjee Furdoonjee Paruck Esq., for the purchase of Standard Geographical Works	1,500	0	0	,,	,, Messrs. Smith, Elder & Co.'s Invoices	52	15	4
,,	,, Government subscription for 12 months.	600	0	0	,,	,, Commission to Remington & Co. Treasurers, on payments Rs. 600 at one per cent.....	6	0	0
,,	,, Annual subscription from Members:—								
	Received from two Members in composition of future payments Rs. 200				,,	,, Balance on this date, viz:—			
	On account of 1862-63 ..... ,, 15					In the hands of the Treasurers .....Rs. 2,172 9 3			
	Ditto of 1863-64 ..... ,, 555					Ditto of the Secretary ,, 369 5 0			
	Ditto of 1864-65 ..... ,, 270						2,541	14	3
		1,040	0	0					
,,	,, Amount realized by the sale of Philosophical Instruments during the year 1863-64, viz:—								
	On account of single Lens. Rs. 1 0 0								
	Ditto of double Lens .. 4 8 0								
	Ditto of triple Lens....15 0 0								
		20	8	0					
,,	,, Amount realized by the sale of the Society's Transactions during the year..	51	8	0					
,,	,, Interest from Messrs. Remington & Co., Treasurers, at 4 per cent. per annum.	34	13	11					
	Total Rupees....	4,586	3	8		Total Rupees....	4,586	3	8

Examined and found correct
J. T. ANNESLEY.
J. BURGESS.

(Errors excepted)
D. J. KENNELLY,
Secretary to the Society.

TRANSACTIONS

OF THE

BOMBAY GEOGRAPHICAL SOCIETY.

ART. I.—*Remarks on the Bombay Tidal Observations for* 1861.—By J. BURGESS, Esq., F.E.I.S.

Read before the Society, January 15th, 1863.]

FEW subjects of physical research are beset with more difficulties than that of the Tides. Owing to the very irregular conformations of the shores of the ocean, the great variety of its depths, especially near the coasts, the currents and frictional resistance the waters meet with on the one hand, and on the other to the ever-varying relations of the disturbing forces, it becomes impossible to obtain a general solution of the problem of the Tides, and a matter of some difficulty to arrive at a correct representation, in mathematical terms, even of an empirical form for the local phenomena belonging to individual ports. Only by means of long series of accurate observations, can we hope to arrive at a correct knowledge of these phenomena, and obtain the necessary *data* from which to foretell the irregularities of their returns and of their heights in the various harbours. Their importance to the social and commercial interests of mankind, has influenced all commercial people to provide for their careful and continued observation, and from such have been derived the means for computing the times and heights of the tides for almost every great port in the world, with an accuracy that is frequently remarkable. Notwithstanding its importance, however, as one of the

most commercial cities of Asia, Bombay has not yet been provided with tide-tables even of sufficient accuracy to satisfy nautical men.

More than 19 years ago, the East India Company's Government sanctioned the establishment of a proper tide-gauge at the Colaba Observatory; and from December 1845, the Government has liberally defrayed the expenses of the Observatory, an essential portion of the duties of which is the correct observation of the tides. It is greatly to be regretted, that for some time these were frequently interrupted, and from a remark made in the volume of Observations for 1858, it may be inferred that, even some of those published are unworthy of confidence. The slight repairs necessary having been effected since then, the observations have been more continuous, and probably also much more trustworthy. At the last meeting of this Geographical Society, the volume of Observations for 1861 was presented. It contains the observations of about 670 tides during the year; an examination of which, to some extent, I lately attempted during a few days' leisure, and now beg to submit some of the results to this Society, in the belief, that the subject at least may not be entirely without interest to some of the members, and with the hope that, by calling attention to it, some one may be induced to add further to our knowledge of the tides at this port. In 1847, as soon as two years' observations had been collected, Commander Montriou, then Superintendent of the Colaba Observatory, with a zeal and industry in the highest degree creditable, had a tentative solution of the problem of the Bombay tides attempted.* The *formulæ*, whose constants were derived, were modifications of those suggested by Dr. Whewell, in his "Empirical Laws of the Tides," and these have been used ever since, without correction from the mass of accumulated observations, for the computation of the times of high-water, annually published in the Bombay Almanacs. Complaints have been made about the inaccuracy of these predicted times, and it occurred to me, to compare the results of Mr. Montriou's *formulæ* with the actual observations for one whole year, in order to ascertain how far the *formulæ* might be depended on, not without the expectation that, as they were founded on two

* After this paper had been read, I was informed that the reduction was effected by the late Professor Orlebar. I have accordingly altered the name in the following parts of this.

years' observations only, there would be slight discrepancies varying with the hour of the moon's transit, but probably occurring in accordance with some law. Different methods might have been pursued in the examination. The following plan was adopted. The mean difference was found between the time of observed high-water and the moon's meridian transit for every hour of the day and for both transits separately.* Thus, it was found that at new moon the mean tide precedes the moon's upper transit at 12 o'clock by $33\frac{1}{8}$ minutes, and the lower transit by $33\frac{1}{4}$ minutes, and at full moon it precedes the upper transit by $31\frac{3}{5}$, and the lower by $28\frac{4}{5}$ minutes. The differences between these numbers are comparatively small; none of them varying 3 minutes from their mean value, about 32 minutes. So again it was found, that when the transits occur at 1 o'clock, these times are 51·2, 53·8, 44·4, and 56·4 minutes, the average being about 52, and the variations from the mean value not very large; but at the later transits the discrepancies in these differences become larger, nor do the variations in the different groups seem to follow any distinct laws; whence it may be inferred that, as each number is the average result of from 10 to at most 17 observations, the discrepancies may, partially at least, arise from observational errors of individual tides. In order, if possible, to elicit some results, it was therefore necessary to combine the observations in larger numbers. This was done in four ways.

1*st*.—Those of the first half of the lunation were combined with the corresponding quantities for the second half for each transit.

2*nd*.—Those of the upper were combined with those of the lower transits.

3*rd*.—All the observations of either transit, belonging to times of transit between 6·30 A.M. and 6·30 P.M., were combined into twelve horary groups.

4*th*.—The observations for both transits and both halves of the lunation were combined into 12 groups of about 56 observations each.

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* The transit immediately succeeding the time of high-water was employed only because it is the one used by Professor Orlebar.

Hour.	Upper Transit.			Lower Transit.			Both Transits.			Day Obs. only.
	1	2	3	4	5	6	1 + 5	2 + 4		
	P.M.	A.M.	Mean.	P.M.	A.M.	Mean.	P.M.	A.M.	Mean.	
	m	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*m*
0	—33·2	—31·6	—32·3	—28·8	—33·3	—31·0	—30·2	—30·3	—31·7	—31·0
1	51·4	44·4	48·4	56·4	53·8	55·1	52·4	51·1	51·7	53·6
2	65·2	65·5	65·3	82·1	55·3	69·2	59·9	73·8	67·4	74·6
3	72·7	84·4	78·6	95·6	79·6	88·3	76·0	90·2	83·4	84·6
4	88·4	87·6	87·9	91·4	79·8	85·5	83·9	89·3	86·7	89·1
5	84·2	88·1	86·4	91·0	90·2	90·7	87·7	89·7	88·7	87·8
6	63·2	77·4	67·2	94·8	80·8	87·8	72·6	82·2	77·7	80·1
7	41·7	47·7	45·0	69·3	50·7	60·0	46·3	58·0	52·4	48·4
8	11·0	34·7	25·2	38·2	16·4	27·8	14·0	56·5	27·1	26·4
9	4·0	9·4	6·8	13·7	2·5	8·9	3·4	11·5	7·7	6·5
10	+ 1·8	+ 3·4	+ 2·6	19·7	2·2	11·2	0·1	8·8	4·4	+ ·5
11	—14·0	—10·3	—12·2	13·0	10·3	11·5	11·7	11·6	11·7	—10·3
			—46·1						—49·2	—49·5

In this manner a table of the accelerations of the tides for each hour of transit was formed. Taking then first the results connected with the upper transit, the mean of the whole is —46 minutes. This is what Dr. Whewell calls the mean or *correct establishment* of the port. Next, by means of the accelerations for the different hours of transit, we can determine the acceleration for any required time of transit. Thus it is found, that the average acceleration ·46*m*. belongs to the time of transit 0*h*. 52½*m*. or when the moon's elongation from the sun is about 13° 10′. Now, if we employ the known equation—

$$\frac{\text{Sun's attractive force}}{\text{Moon's attractive force}} = \frac{S}{M} = \sin 2\,\text{☾'s elongation}$$

we obtain $\frac{S}{M} = 0{\cdot}443$, or the moon's effect in raising the tides 2·26 times the sun's, and hence the moon's mass $\frac{1}{78{\cdot}3}$ of the earth's.

The accelerations at the lower transit are too irregular when taken alone to give any satisfactory results; but when combined with those at the upper transit, and operated upon as before, we obtain for the mean establishment—49*m*., the time of transit corresponding to the mean acceleration to be 49*m*., or when the moon's elongation is 12° 14′ nearly,—corresponding to the value of $\frac{S}{M} = {\cdot}416$, and giving

the moon's mass $\frac{1}{74}$ of the earth's—results agreeing very closely with those derived from the upper transit tides alone.

Again, taking the results of the observations belonging to the transits between 6-30 A.M. and 6-30 P.M. only, their mean value is found to be 49*m*., and the time of transit for mean acceleration is found to be $50\frac{1}{2}$ minutes, corresponding to an elongation of 12° 37′;—whence, again, $\frac{S}{M} = \cdot 426 = \frac{1}{2 \cdot 345}$, and the ☾'s mass $= \frac{1}{76 \cdot 2}$.

By three different arrangements then, we derive the mean or corrected establishment of the port about = 49 minutes* (the vulgar establishment being —32*m*.); the corresponding elongation of the moon being about 12° 40′; the ratio of the forces of the sun and moon $\frac{S}{M} = \cdot 428$, or the moon's force, not exceeding 2·38 times the sun's, and the moon's mass $\frac{1}{76}$. The age of the tide may likewise be roughly determined to be about 1·1 day. Now, in Professor Orlebar's *formulæ*, the values assigned to these quantities are as follows:—The mean establishment he fixes at —58*m*., the moon's elongation 17° 30′, the moon's attractive force 2·60 times the sun's, and the moon's mass $\frac{1}{70}$ of that of the

* The late Mr. Dessiou prepared a table of the Semi-menstrual Inequality founded on observations at London, Liverpool, Pembroke, Ramsgate, Sheerness, Portsmouth, Plymouth, Brest, and St. Helena, of which the following is an abstract:—

Moon's Transit.	Semi-mens. Inequality.	Moon's Transit.	Semi-mens. Inequality.	Moon's Transit.	Semi-mens. Inequality.
h. *m.*	*h.* *m.*	*h.* *m.*	*h.* *m.*	*h.* *m.*	*h.* *m.*
0 0	—0 0	4 0	—0 55	8 0	—0 15
0 30	—0 6	4 30	—1 0	8 30	—0 1
1 0	—0 13	5 0	—1 3	9 0	+0 9
1 30	—0 20	5 30	—1 5	9 30	+0 15
2 0	—0 28	6 0	—1 3	10 0	+0 16
2 30	—0 36	6 30	—0 56	10 30	+0 15
3 0	—0 43	7 0	—0 44	11 0	+0 11
3 30	—0 49	7 30	—0 30	11 30	+0 6

If then the tides at Bombay have a similar degree of semi-menstrual inequality, we might find the approximate time of the tide by applying the inequality, taken from the above table, to the time of the moon's transit, and then subtracting 49*m*. Corrections would require to be applied for the variations of the declination and parallax of the sun and moon, &c.

earth; but he does not state how he derived them: they agree very closely; however, with those derived by Laplace in his earlier Memoir on the Brest tides, from which he obtained $\frac{1}{6\cdot9}$ as the moon's mass, and 18° as the elongation at the time of mean retardation of the tide at Brest, whilst he made the moon's effect in raising the tide 2·6167 times the sun's. Now, as these are the quantities from which the principal correction or "semi-menstrual inequality" is obtained, it is of importance that they should be determined with all practicable accuracy. From want of time, I have been unable to verify the above results by an investigation of the values given by the heights of the tides. That they are fair approximations to the true values, however, may be inferred from the confirmation they obtain from other sources. Thus, in the investigation by the Astronomer Royal respecting the tides in certain Irish ports, he found the values of the ratio $\frac{S}{M}$ at Kilbaha = ·41, Casleh Bay ·43, Galway ·43, Old Head ·42, Mullaghmore ·40; the mean of which values is ·418, and its reciprocal, or the ratio of the moon's force to the sun's 2·39, which makes the moon's mass $\frac{1}{7\cdot4}$ or $\frac{1}{7\cdot5}$ of the earth's. Moreover, though in his first memoir Laplace found the moon's mass from the Brest observations $\frac{1}{6\cdot9}$ of the earth's, in a later discussion, of a more extensive series of observations at the same place, he found it $\frac{1}{74\cdot95}$. Again, from purely astronomical data, Baily gives the same quantity $\frac{1}{79\cdot69}$, Peters and Schlidloffsky $\frac{1}{81\cdot1}$, and Adams $\frac{1}{81\cdot5}$. It may be inferred then, that the value $\frac{1}{70\cdot1}$, as employed by Professor Orlebar is probably too large, and the dependent ratio $\frac{1}{2\cdot60}$ requires to be proportionately altered.

The effect of changing the mean establishment and moon's mass to the extent just indicated, would be to increase the semi-menstrual inequality, and make the predicted time of high-water later by varying amounts. This seems to be required; for, returning to the observations, it is found that, by dividing the algebraic sum of the differences between the computed and observed times of high-water by the number of observations in each case, the mean difference at upper transit is 12·4*m*. and at the lower transit 6·6*m*., the mean difference of the day tides only at the upper transit 10·8*m*. and at the lower 3·3*m*., and for the night tides 14*m*. and 10*m*. respectively; and, finally, of the whole 9½ minutes, all these quantities being affected by the same sign, and indicating that the mean computed times of tide are too early.

The corrections in Professor Orlebar's *formulæ* for variations of parallax and declination are only empirical, and consequently, though made to represent with considerable accuracy the observations of 1846-47, from which they were derived, they may vary very considerably when applied to more recent observations. Certain limits of instrumental error must of course be always admitted. Mr. Montriou says, the gauge registers the tides generally correct to within 5 minutes of time; and in extreme cases only were the times of spring tides uncertain to 10 minutes, of neap tides to 25 minutes. On examining the differences between the observed and computed times of high-water however, I found them to be as follows:—

Diffs. from 0*m.* to 6*m.*	at U. T.	Obs.	at L. T.	Obs.	total	Obs.	
6 — 12	40		41		91		
12 — 18	48		48		96		
18 — 30	66		80		146		
30 — 45	46		61		107		
45 — 60	32		35		67		
60 — 90	29		25		54		
90 — 120	12		5		17		
120 — 150	2		4		6		81
150 — 180	0		2		2		
180 +	0		2		2		

If the gauge is still to be trusted generally to within even 10 minutes on an average, these differences present some difficulty: three-fourths of the observations lie beyond the limits of instrumental error. Whence does this arise?

1. Are the observations unworthy of confidence—especially for tides attending the transits between four and eleven hours?

2. May not the *formulæ* fail to represent the true times of high-water with sufficient accuracy? Or—

3. May not small instrumental errors, and occasionally others of even considerable amount, combine with erroneous results of the *formulæ* to give rise to such a variety of differences?

The smallness of the *algebraic* sum of the differences, as already stated, and which harmonises so well with an alteration of the mean establishment by about 10 minutes, seems to indicate that if there are errors in the observations, they are at least not *very*

unfairly balanced—the positive against the negative; and if this be not an accidental result, the first supposition is excluded, and we must infer that the differences are partly, if not mainly, owing to the insufficiency of the *formulæ* to represent the phenomena. To prove this, a more extensive investigation of the observations of other years would be required. It may be tested, however, to some extent by a graphical construction. I accordingly laid down the whole 335 tides of the upper transit, both as computed and observed in reference to the times of nearest transits;—and an examination of this projection showed that, whilst for continued periods the observations followed continuous curve lines, there were also breaks in the continuity that seem only explicable on the supposition of considerable observational errors. Independently of these exceptional instances however, a large number of observed lines lie quite beyond the limits assigned by the *formulæ* to any tide throughout the year.

In conclusion then, it seems evident that the tables and *formulæ* of Professor Orlebar are not sufficient for the prediction of the tides at this port. Indeed, he himself never intended that they should be used longer than until 9 or 10 years' observations had been collected, and a fuller investigation could be entered upon. During the course of 16 years, such observations have now been accumulating at the expense of Government, and if, in respect to this matter, Bombay would stand in creditable comparison with other commercial cities, we must have a fresh investigation of the tides based on these observations. Sufficient materials have been ready for the last six years. Of the importance to public interest of a thorough discussion of them for the production of correct tide-tables for this harbour, there are Members in this Society better able to judge than I am. I have to regret that want of leisure has prevented my making this examination more extensive and more fruitful in definite results,—an examination of the heights of the tides might have confirmed the results derived from the intervals, and developed other particulars which I had attempted to elicit by calculation, but had not time to verify.

ART. II.—*Further Discussion of the Tidal Observations made for Government at the Colaba Observatory in* 1861.—By J. BURGESS, Esq., F.E.I.S.

[Read before the Society, February 19th, 1863.]

AT the last meeting of the Geographical Society, I read a paper on the value of Professor Orlebar's formula, as applied to the prediction of the Bombay tides, founded on the relations between the means of the computed and observed times of high-water at the Colaba Observatory in 1861. From theory, and from the alterations that have taken place in the harbour within the last 15 years, it was to be inferred that the formula, founded on a comparatively small number of observations, could not now be counted upon as sufficiently accurate. The paper was based upon the natural assumption that the formula was at fault, and that the observations recorded and published were generally trustworthy. Want of time prevented my examining them any farther than determining the algebraic sum of the differences between the observations and computed times, which happened to amount only to about 10 minutes. Certain observations I did suspect to be considerably in error, but it is only since the meeting, and in consequence of remarks then made by Lieutenant Fergusson, the Government Observer, and Captain Barker, the Master Attendant, that I have examined the observations individually—with what results will immediately appear.

I may however premise, that it was my intention to determine the constants in the formula necessary for representing the times of high-water for 1861, by which to test the accuracy of the observations. Not having full confidence in the values of the constants mentioned in my former paper, and which were derived almost solely from the observations at or near the syzygies, I attempted to determine x the ratio of the lunar and solar effects, and y the moon's elongation from the sun at the time of the highest tide from the intervals between the moon's transit and high water at each hour. This gave me twelve equations of the form—

$$x \sin A - \sin (B-A) \cos 2y + \cos (B-A) \sin 2y = 0$$

$$2g$$

in which A and B are found for each hour from the observations. In attempting to solve so large a group of equations, however, irregularities became evident, and showed that the observations must first be examined individually by some approximate method: Now, Captain Barker informed the Society at the last meeting, that by adding $9h.\ 10m.$ to the time of the preceding tide at London Bridge, the local time of high-water at the Bombay dock gate was obtained with considerable accuracy. This supposes the age of the tide at Bombay above 2½ days. The Government Observer also stated, that he was in the habit of subtracting $2h.\ 50m.$ from the date of the London tide for that of the Bombay tide, and preferred this method as more accurate than Professor Orlebar's formula, though the Observatory assistants were allowed to use that formula in the computations supplied to the Bombay Almanacs. This method supposes the age of the tide to be fully 2 days;—the constant being the sum of the establishment of the port at London, which is $2h.\ 7m.$ after the moon's transit at new and full moon, the difference of the times of transit, which is about $10m.$ earlier at Bombay than at London, and the establishment at Bombay, which—as shown in my former paper—is about $33m.$ before the time of transit. Then the interval between two successive tides at the times of conjunction and opposition being about $12h.\ 21m.$, if we subtract $2h.\ 50m.$ from this interval, we obtain $9h.\ 31m.$—this constant, which for convenience of reference I shall call the first, or Captain Barker's, ought to be added to the times of the London tides to give the tide date at the Colaba Observatory. The observed times of high-water at the syzygies, I have remarked, are very accordant, and the mean times of all the tides at new and full moon, taken from the observations for 1861, and compared with the corresponding London tides, confirms the values of $9h.\ 31m.$ and $2h.\ 50m.$ obtained for these first and second constants.

Here, then, are two methods of testing the accuracy of the observations, suggested by gentlemen who have opportunity of knowing their accuracy, and who have declared them to be good approximations. Theoretical considerations, however, lead us to suggest:—First, that of all ports, London is among those worst situated as a port of reference, being near the mouth of a considerable river falling into a sea that receives two tides differing by half a tidal day in age, and whose compound effect is the London tide. Brest, so celebrated in connection

with the investigation of the tidal theory, is not open to any such objection, and would certainly be a good port for reference in the way proposed. But, secondly, the age of the tide at London is upwards of two days, whilst at Bombay it must lie between one and one and a half days. Hence the local dates of similar tides at London and Bombay cannot differ less than $14h.$, nor probably more than $28h.$; more accurately, the London tide must be at least about $1^d 11h.\ 59m.$, or possibly even $27h.\ 24m.$* later in local time than the corresponding tide at Bombay. These I shall call the third and fourth constants respectively: a considerable number of observations only could decide which constant ought to be used. The tides for which they will differ most are those which accompany the transits between $6\frac{1}{2}h.$ and $8\frac{1}{2}h.$, whilst those for which Lieutenant Fergusson's and Captain Barker's methods vary most, accompany the transits between $7\frac{1}{2}$ and $9\frac{1}{2}$ hours Civil Time. If to these we add Professor Orlebar's formula, we have in all five different methods of approximating to the times of high-water. The question now to be answered is:—"*Do the observations made and recorded at Colaba agree generally with any one of these approximations?*" If they do, we are at once in possession of an easy method of computing the times of high-water with tolerable accuracy for general purposes; and what is of more importance, we may employ the observations with confidence in the determination of correct formula for the prediction of the local tides, and so far accomplish the object for which they are carried on by Government. Besides, if one of these approximations represent generally the observed times of tide, within say even 20 minutes, we shall be justified in rejecting as erroneous any observations which appear exceptional or very much beyond the utmost limits of error. With such objects in view, I have compared each of the 335 observations of the times of high-water at the upper transit, as registered in the volume for 1861, with the results of Professor Orlebar's formula, and with the times derived from those of the London tides, by the application of each of the four time-constants alluded to. Founded, as the latter are, on the difference of the establishments of the port at London and Bombay, they necessarily all give nearly the same dates for the tides at new and full moon, but often differ considerably in the times of intermediate high-waters.

The following are the results of the examination:—

* More correctly perhaps $15h.\ 4m.$ and $27h.\ 27m.$

Differences in Minutes.	Orlebar's Formula. +	Orlebar's Formula. −	London Tide. + 9h. 31m. +	London Tide. + 9h. 31m. −	London Tide. −2h. 50m. +	London Tide. −2h. 50m. −	London Tide. −14h. 59m. +	London Tide. −14h. 59m. −	London Tide. −27h. 24m. +	London Tide. −27h. 24m. −
0m.	4		2		8		9		8	
1m. to 5m.	23	23	29	22	27	19	25	34	24	25
6 — 11	33	17	35	19	43	24	21	27	32	32
12 — 17	33	15	26	32	24	25	11	33	21	19
18 — 23	22	9	25	15	24	16	18	25	10	26
24 — 29	27	8	16	4	15	6	8	19	21	13
30 — 40	20	15	11	12	19	12	17	22	12	20
40 — 50	16	7	17	3	12	5	8	11	13	16
50 — 60	12	8	15	0	9	1	4	11	5	5
60 — 75	16	5	13	0	21	0	11	4	10	9
75 — 90	8	0	15	0	6	0	8	3	6	3
90 — 105	7	1	9	0	9	0	4	0	2	1
105 — 120	3	1	5	0	5	0	1	0	0	1
120 — 150	2	0	9	0	4	0	1	0	1	0
150 — 187	0	0	2	0	1	0	0	0	0	0
Totals	222	109	226	107	219	108	137	189	157	170
	m	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*m*
Average error	+ 31·8	−24·6	+ 37·8	−15·5	33.5	−16·5	+ 30·4	−21·6	+ 26·6	−25·2

\+ Denoting that the observed falls *after* the computed times.
— Denoting that the observed falls *before* the computed times.

Or, the final results of the comparisons may be condensed, as in the following table:—

Differences between Observations and the results given by the formula and the Constants.	By Professor Orlebar's formula.	By the First Constant, + 9*h.* 31*m.*	By the Second Constant, −2*h.* 50*m.*	By the Third Constant, −14*h.*59*m.*	By the Fourth Constant, −27*h.*24*m.*
0*m.* to 12*m.*	100 obs.	107 obs.	122 obs.	116 obs.	121 obs.
12 — 30	114	118	109	114	110
30 — 60	78	58	58	73	71
60 — 90	29 } 41	28 } 42	27 } 41	26 } 31	28 } 32
90 — 120	12 }	14 }	14 }	5 }	4 }
120 — 150	2	9	4	1	1
150 — 187	0	1	1	0	0
No. of Obs.	335	335	335	335	335
Average error	±29*m.*	±30·3*m.*	±27·2*m.*	±24·6*m.*	±25·3*m.*

Thus, then, of the whole of the observations at the upper transit, there are not above 45 per cent. even tolerably concordant with any one of the methods of approximation; and excepting a few observations at the times of new and full moon, it would evidently be impossible to point out with accuracy the individual observations which might be trusted within certain limits.* Thus, if we take the tides of June 19th and 30th, 1861, the errors are as follows:—

	Tide of 19th June.	Tide of 30th June
By Professor Orlebar's formula	54*m.* late.	125*m.* late.
By the First Constant	103 „	109 „
By the Second Constant	89 „	106 „
By subtracting 14*h.* 59*m.* from the 2nd London tide after	65 „	88 „
By subtracting 27*h.* 24*m.* from the 3rd London tide after	57 „	82 „

* The diagrams (shown to the meeting) best illustrate this. On each diagram is laid down the course of the observed times of high-water throughout one lunation, and also of the times as computed by Professor Orlebar's formula, and by the application of each of the four constants to different tides at London Bridge. The vertical distances between the line of the observations and any of the lines of computation, show the errors of observation of the selected tides according to the method chosen for comparison. The diurnal inequality will, no

Again, the observed time of high-water August 21st, is in error—

By Professor Orlebar's formula	15*m.*	early.
By the First Constant	31	,,
By the Second Constant	27	,,
By the Third Constant	35	,,
By the Fourth Constant	26	,,

By each of the first three methods, the number of tides registered at times *later* than the computed is fully double those registered *earlier*, and the average error *late* is more than double the error of those apparently too early. The third and fourth constants bring both the number and amount of errors nearer to an equality; but these constants having been chosen so as to bring the algebraic sum of the errors nearly to zero, both are probably a few minutes less than the values which theory indicates. In this all agree—that the mean error of those observations that are *too late*, exceeds the mean error of those which are *too early*. Thus the average errors of the observations as indicated by the different approximations are—

	Average error too late.	Average error too early.	Mean error of all.
	m.	*m.*	*m.*
By Professor Orlebar's formula	31·8	24·6	29·0
By the First Constant, or + 9*h.* 31*m.*	37·8	15·5	30·3
By the Second Constant, or —2*h.* 50*m.*	33·5	16·5	27·2
By the Third Constant, or —14*h.* 59*m.*	30·4	21·6	24·6
By the Fourth Constant, or —27*h.* 24*m.*	26·6	25·2	25·3

In the *Memoires de l'Académie*, 1818, Laplace says, "Il est temps enfin d'observer ce genre de phénomènes avec autant de soin que les phénomènes astronomiques,"* and more than forty years afterwards we have observations chronicled, in which there are not merely a few observations which fall considerably short of an approach to the accuracy with which all astronomical phenomena are recorded, but among which errors are so numerous and so great, that the mean numerical error of each of a whole series of more than 330 observations amounts to not less than from 25*m.* to 30*m.* I need not say how disappointing such a result as this is: not only is one year's observations almost lost,

doubt, partially account for some of the errors, and perhaps entirely for others; but even after it has been taken into account, the discrepancies will still be many and often considerable.

* Memoires de l'Académie, 1818, page 2.

but it tends to lessen our confidence in those of other years; and from a cursory examination of those for 1858, I am inclined to suspect they are equally valueless. How they should be so it is not for me to determine—if it is to be attributed in part to the instrument, it is certainly a great pity that the observations were not stopped at once when it first failed to give correct indications; or they might have been made independently of the guage until it had been again restored to working order.

Postscript.

It was only yesterday morning I had the opportunity of perusing the report of Lieutenant Fergusson's remarks at the last meeting. These I think require further notice. Lieutenant Fergusson seems to place very little value on the correct registration of the tides, and attributes a surprisingly large effect to the wind on the times of high-water. In this latitude, where the winds vary their direction with the seasons, we may expect that formulæ founded on the observations will embrace their mean effect. But independently of this, it is remarkable if the effects are so great as those attributed. Sir John W. Lubbock, in order to ascertain the effects of the different winds in accelerating or retarding the time of high-water says, he "calculated all the times of high-water for the year 1826," and "requested Mr. Dessiou to classify the tides observed in that year according to the different winds noted against every observation in the register" kept at the London Docks. The greatest retardation was found to occur when the direction of the wind was ESE., and the mean of the times of 14 observed tides was found to differ only 7 minutes from the computed times. The greatest average acceleration was found to be 12 minutes on an average of 37 observed tides when the direction of the wind was NW. Again in a later paper, exhibiting the final results of his discussion of the London Dock observations from 1808 to 1826 inclusive, he states the mean effect on an average of 16 observations, when the direction of the wind was ESE. to be a retardation of only 5 minutes and a depression of 3 inches on the height; the average acceleration when the direction of the wind is SSW. he gives as 4 minutes. These are the largest mean differences given between observation and calculation. Observations at other ports also tend to show that the effect of the wind is not generally very great. The Committee of the British Association, in their Seventh Report on Waves, say—"The magnitude of

the tide is admitted generally to be affected by it [*i. e.* the wind] in some way, but it is matter of doubt, whether the time of the tide, or rather the velocity of the tide waves, is at all affected. M. Daussy denies the existence of such an effect in the French observations, while it has been found by Mr. Lubbock in the London tides;"* and again at the conclusion of the same report they add—"It is difficult to determine whether the wind produced a decided effect on the velocity of these tides. By a discussion which was attempted, it appeared that on all the days in which the easterly wind prevailed, compared with all the days in which the westerly wind prevailed, there was a difference of one minute more and of one minute less than the mean; the tide being accelerated by the coincident wind and retarded by the opposing one."† Hence it would seem, that the error in the times of the Bombay tides, attributed to the wind, must, to a large extent, be due to the method of computation, and that this part of the error would disappear if the observations were made with sufficient care to enable us to determine the mathematical expression representing them. This careful observation, however, appears to have given Lieutenant Fergusson no anxiety; he considers that "all that is required," is to obtain the time "with sufficient accuracy for practical or nautical purposes." Now, if this be all that is desired, it seems to be quite unnecessary for the Government Observer to continue his imperfect observations, seeing, as he says, he can predict the time of high-water with this degree of accuracy from the Nautical Almanac. But surely higher purposes are to be served and for which a cycle of accurate observations made at Bombay might be of the greatest value. The tides are still an interesting subject of scientific research. Mr. Haughton is at present engaged in reducing the observations made in the Arctic Ocean, and the same physicist has advanced our knowledge by the separation of the solar and lunar effects. It is, indeed, actually found at some ports—as Mr. Airy first pointed out in the case of Courtown in Ireland—that the solar tide is greater than the lunar one. Again, it is well known that at certain phases of the tide it rises or falls in some harbours more in ten minutes than at other phases it does in an hour. In such cases it is evident that an error of even small amount may be of considerable consequence even to

* British Association Reports, 1837, page 420.

† Id. p. 463.

nautical men. The observations should be made subservient to improvements in the theory of the tides, and if made with sufficient care, will indicate, I doubt not, the effects of variations in the atmospheric pressure—a subject on which we require more information than has yet been collected. Being within the tropics too, the effects of the variations in the declinations of the sun and moon might probably be studied with considerable advantage. The rigidity of the earth has also recently been suggested as deserving scientific examination, and for this purpose careful tidal observations must be of great value; and though I am not prepared to say that Bombay is very advantageously situated for this object, still, having a comparatively low latitude, they might prove of some value.

If all or any of these objects are to be served by the Colaba Observations, I think the Members of this Society will agree with me, that those already collected must be examined, in order to the rejection of most, if not all, of those made from the time at which they first became untrustworthy, and that in future they ought either to be so carried on as to secure more accurate results, or else dropped altogether.

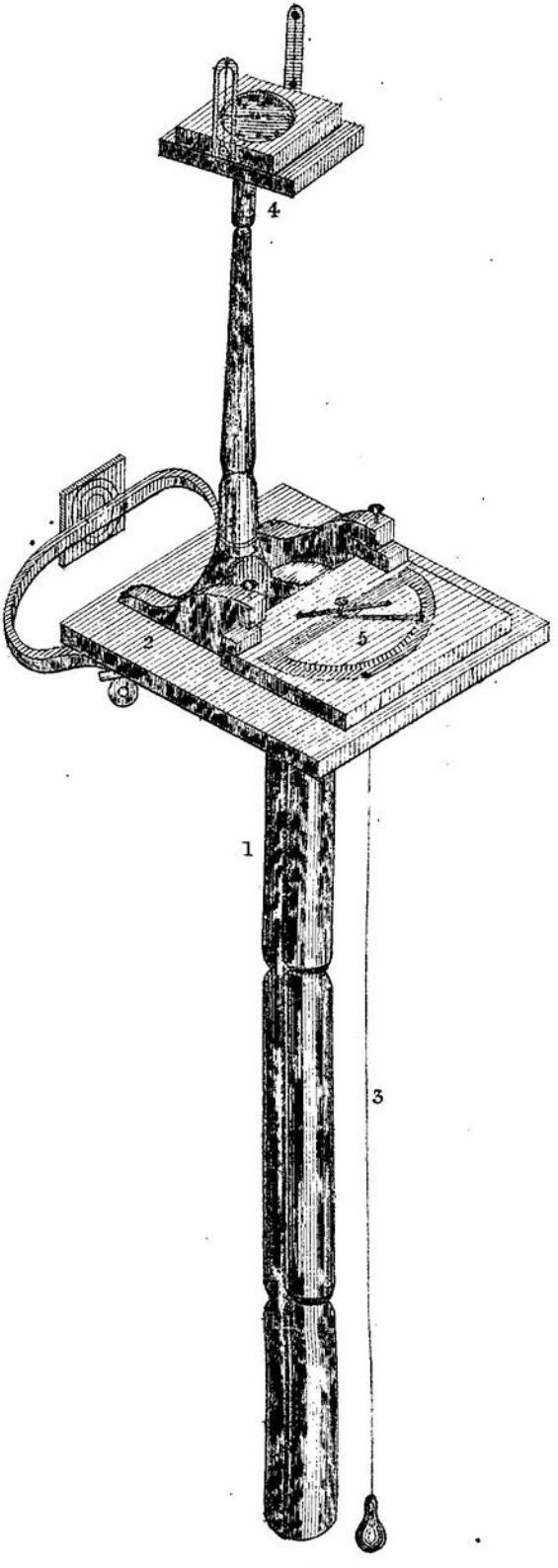
ART. III.—*A Description of a Magnetimeter, by which the Magnetic Dip is determined from the Horizontal Deflection of a Magnetic Needle, produced by terrestrial induction in a bar of soft iron.*—*By* Lieutenant F. WHERLAND, R.N.R., Commanding Ship "Tudor."

[Read before the Society, May 21st, 1863.]

I CALL this model a Magnetimeter, as the late Dr. Scoresby called his invention by the same term. With his, the dip of the Magnetic Needle is determined by the position in which a bar of soft iron is when it ceases to be magnetic from terrestrial induction; the principle of the above is, a bar of iron kept in the vertical deflects a horizontal magnetic needle when at a proper distance at a given place to give an angle equal to the dip, gives the dip afterwards for every part of the globe, with an accuracy that may be made use of in checking dead reckoning when astronomical observations cannot be had.

Before going into a description, it will be as well to state, that there are errors attending this instrument, such as induced magnetism from the magnetic needle employed in the bar of soft iron, and the length of the needle, in proportion to the distance from the deflecting force, the remote end of the needle's repulsive force diminishing in a much greater ratio than the augmentation of attractive force of the nearer end. The first can be very much decreased, by employing a large bar in proportion to the needle, and the second may be corrected, if requisite, by a very simple calculation; but for practical purposes, I believe it (as far as my experience goes) to be sufficiently correct when got up on a larger scale and a properly graduated arc.

According to well known laws, a bar of very soft iron becomes magnetic when held in a direction with the dip of the magnetic needle, and as this bar departs from this direction, the cosine of the angle which it makes is equal to the dip: for example, we will say the dip at Bombay is 20°, the bar of iron hanging vertically is 70° from dip, therefore the cosine 20°, is dip. In England the dip is 70°, the vertical bar is only 20°, giving the cosine 70°; and just in the same


4
2
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1
3

proportion the magnetism in the bar from terrestrial induction undergoes a change, so that if a proper proportioned needle once set at a distance from the bar so as to give a deflection equal to the proper amount of dip, according to the foregoing laws, the dip will be in accordance with the change of position all over the globe. I was at first led to experimentalize on the magnetic change in the bar of soft iron, from the discussion between the Astronomer Royal and Dr. Scoresby. For a more correct determination, I constructed the instrument about to be described ; the result is, that the condition of soft iron changes exactly with the magnetic dip, and the change agreed so well with the Admiralty Dip Chart lately published, that I conceived the idea, that it may be employed for determining the latitude in many parallels with the aid of the longitude, and the longitudes in other parts of the globe with the help of the latitude ; and another experiment of no little interest was, a bar of iron of ordinary hardness, hammered while in a vertical position in the southern hemisphere, gave a deflection from sub-permanent magnetism of 13° upper end of bar, attracting south pole of needle while we were on the magnetic equator 13° South Atlantic Ocean: the condition of this bar, kept in the same position, did not become neutral until we arrived at 45° N. latitude, having undergone a geographical change of 48° latitude in a space of forty days.

Description of Instrument.

No. I.—A wooden frame hung in gimbals to support a very soft iron bar.

No. II.—A turntable, moving smoothly round an entire circle, having the bar for its centre.

No. III.—A plumb line, to ascertain that the bar is vertical before observation.

No. IV.—A pedestal, supporting a fine magnetic needle exactly over the centre of the iron bar, sufficiently high to be out of the iron's influence, and the box containing needle revolves on pedestal, and is fitted with sight vanes, by which means the needle is moved free from local deviation by the common means of correction (turning it by the bearings of a distant object).

No. V. is a highly magnetized needle, with a graduated arc to note its deflection, and is capable of being moved to or from the iron bar, until the deflection agrees with the magnetic dip of the geo-

graphical position per chart. Under the turntable there is a tangent screw for regulating the motion, and the horizontal is preserved by small moveable weights on this table.

When intended for use, the instrument is taken in a convenient place for observing a distant object, it is properly balanced, the needle made to correspond, and the lower needle so placed as to deflect to an angle equal to the dip of the place. A set of sights are taken at the distant object, with the upper compass, to make sure there is no deviation produced on it by the iron bar or lower needle; should there be any, it is reduced simply by increasing the length of the pedestal. After all the adjustments are complete, the table is moved until the vertical iron bar is at right angles to the natural position of the lower needle, the upper compass showing the magnetic meridian the deflection is noted: the table is then moved round 180°, the second deflection noted, taking care the plumb line is at zero: in the event of the iron having any retentive or sub-permanent magnetism, the bar is reversed end for end, and the experiments repeated, the mean of the whole is taken, and the difference between it and the dip of position is noted + or — for the correction, when used to determine geographical position. It is obvious that, after the corrections are once made, the observations are of a very simple kind, and should there be any doubt about the correctness of the dip-lines on the chart, it can still be made of much use to steamers and vessels constantly plying on the same route; for instance, a vessel leaving here for Aden, making careful observations, would have the same deflection to guide her returning to and making the same port in thick weather in the monsoon.

The description tends to make the observations appear tedious, but they are much more in theory than in practice, and perhaps some will say, "Would not the dipping needle do all this?" but it is well known, a good dipping needle is a difficult thing to be got, very expensive, and easily injured, and does not come to a state of rest so quickly as the needle I have been endeavouring to describe; with an ordinary divided arc at hand, any person with a little mechanical genius can construct this instrument, and the errors occasioned in the dipping needle from friction, dust, &c., so difficult to overcome, is reduced in this plan to the very small inequality that can exist on the fine points of the two pins employed to support the magnetic needles.

The following is a set of observations on this outward voyage:—

Date.	Latitude.	Longitude.	Deflections.	Sum.	Means.	Sum of Means.	True Deflections.	Sum.	Dip on Chart.
1862.									
Dec. 28	2° 50′ S	70° 56′ E	27.00 26.30	53.30	26.45	49.05	24.32 + 2.30	27.02	27.00
			23.00 21.40	44.40	22.20				
,, 29	2 00 S	72 38 E	21.00 20.00	41.00	20.30	43.40	21.50 2.30	24.20	24.30
			23.30 22.50	46.20	23.10				
,, 30	00 56 S	74 43 E	22.00 21.30	43.30	21.45	37.55	18.58 2.30	21.28	22.00
			16.00 16.20	32.20	16.10				
,, 31	00 16 N	76 17 E	18.40 21.30	40.10	20.05	32.50	16.25 3.30	19.55	20.00
			11.10 14.20	25.30	12.45				
1863.									
			15.00 18.00	33.00	18.30				
Jan. 1	1 29 N	76 52 E	11.00 13.40	24.40	12.30	30.50	15.25 3.30	18.55	18.30
			18.10 17.30	35.40	17.50				
,, 2	1 47 N	77 06 E	13.10 12.40	25.50	12.55	30.45	15.23 3.30	18.53	18.30
			12.30 11.20	23.50	12.55				
,, 4	1 48 N	76 04 E	17.00 17.10	34.10	17.05	30.00	15.00 3.30	18.30	18.30
			19.50 21.50	41.40	20.50				
,, 6	1 05 N	77 39 E	14.10 16.10	30.20	15.10	36.00	18.00 3.30	21.30	20.00
			16.00 13.20	29.20	14.40				
,, 7	1 10 N	79 30 E	20.00 18 00	38.00	19.00	33.40	16.50 3.30	20.20	19.40
			20.00 17.00	37.00	18.30				
,, 8	1 11 N	80 57 E	14.00 11.30	25.30	12,45	31.15	15.38 3.30	19.08	19.00
			19.50 22.00	41.50	20.55				
,, 9	1 04 N	81 00 E	17.00 18.20	35.20	17.40	38.35	19.18 0.00	19.18	19.00
			20.00 21.00	41.00	20.30				
,, 10	0 57 N	81 00 E	19.00 17.00	36.00	18.00	38.30	19.15	19.15	19.00
			21.00 19.50	40.50	20.25				
,, 11	1 01 N	80 26 E	17.00 18.20	35.20	17.40	38.05	19.03	19.03	19.00

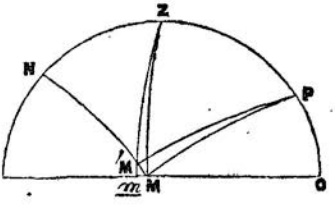
Date.	Latitude.	Longitude.	Deflections.	Sum.	Means.	Sum of Means.	True Deflections.	Sum.	Dip on Chart.
1863.									
Jan. 13	2° 53′ N	79° 24′ E	16.50 15.00	31.50	15.55	29.25	14.43	14.43	15.00
			13.10 13.50	27.00	13.30				
„ 14	4 40 N	77 30 E	13.00 9.20	22.20	11.10	21.10	10.35	10.35	10.35
			11.00 9.00	20.00	10.00				
„ 15	7 03 N	75 34 E	7.00 7.00	14.00	7.00	11.55	5.58	5.58	6.00
			4.50 5.00	9.50	4.55				
„ 17	7 44 N	74 30 E	7.00 4.00	11.00	5.30	9.30	4.45	4.45	5·00
			5.00 3.00	8.00	4.00				
„ 18	9 05 N	74 17 E	4.00 6.30	10.30	5.15	9.30	4.45	4.45	2.50
			2.50 6.00	8.50	4.25				
„ 19	9 15 N	75 40 E	4.00 2.50	6.50	3.25	4.25	2.12	2.12 S	2.00
			2.00 0.00	2.00	1.00				
							Magnetic Equator.		
„ 21	10 53 N	75 20 E	1.40 3.00	4.40	2.20	3.40	1.50	1.50 N	2.00
			1.00 1.40	2.40	1.20				
„ 22	11 35 N	74 52 E	2.10 2.00	4.10	2.05	6.55	3.28	3.28	3.40
			5.00 4.00	9.00	4.50				
„ 23	12 07 N	74 03 E	3.00 5.30	8.30	4.15	7.50	3.55	3.55	4.10
			3.00 4.10	7.10	3.35				
„ 24	13 02 N	74 13 E	4.40 6.50	11.30	5.45	13.40	6.50	6.50	6.50
			7.00 8.50	15.50	7.55				
„ 27	15 22 N	73 10 E	8.00 9.20	17.30	8.45	18.00	9.00	9.00	9.30
			7.50 10.40	18.30	9.15				
„ 28	16 29 N	71 54 E	11.00 12.50	23.50	11.55	24.40	12.20	12.20	12.00
			12.10 13.20	25.30	12.45				

ART. IV.—*A Method of Computing the Times of the Moon's Rising, Setting, and Southing.*—By J. BURGESS, Esq., F.E.I.S.

[Read before the Society, September 17th, 1863.]

OWING to the rapid variations of the moon's declination, angular motion, and parallax, the determination of the times of her rising and setting is more complicated than the analogous problem for sunrise and sunset. The usual method is tedious, owing to the necessity of repeating the calculation after finding an approximate time; but by employing the *mean values* of the parallax and angular motion from the sun, we may construct tables for any latitude, by which the operation may be performed very expeditiously and with considerable accuracy, even when the second correction is neglected. The corrections in such a case will only be such as arise from variations from the mean values of the elements, especially the angular motion.

To form the tables:—
Let NZP be the meridian, Z the zenith, P the pole, and MN the arc described by the moon. Then—



Let l = the latitude of the place = PO.
d = the moon's declination,
= PM —90° or 90°—PM.
H = the hour angle ZPM,
= 180°—MPO.

Then, in the spherical triangle MPO, right angled at O—

$$\cos MPO = -\cos ZPM = \frac{\tan PM}{\tan PO}.$$

Now PM = 90° ± d,

Hence, $\cos H = -\tan l \tan d$ ..... (1)

But the effect of refraction is to make the body appear elevated above its true position, whilst that of parallax is to make it appear depressed

Now in the case of the moon, the mean horizontal parallax is $57'$, and the refraction may be taken at $31'$, so that the moon will appear at m, when in fact it is at the point M′ in the vertical circle mM′Z, the mean distance mM′ being about $57'-31'=26'$.

To correct the angle H then for the mean effect of parallax and refraction—

Let δ = the arc mM′ of the vertical mZ, the effect of refraction and parallax conjointly.

a = the angle M′PM, the retardation of the time of rising.

Then, in the spherical triangle ZPM′—

$$\cos ZM' = \cos(90^\circ - mM') = \cos ZP \cos PM' + \sin ZP \sin PM' \cos ZPM'$$

or, $$\sin mM' = \sin\delta = \sin l \sin d + \cos l \cos d \cos(H-a) \quad \ldots\ldots\ldots (2)$$

So also in the triangle ZPM, where $\cos ZM = \cos 90^\circ = 0$,—

$$0 = \sin l \sin d + \cos l \cos d \cos H \quad \ldots\ldots\ldots\ldots\ldots (3)$$

Then, subtracting (3) from (2),—

$$\sin\delta = \cos l \cos d\,[\cos(H-a) - \cos H]$$

but $$\cos(H-a) - \cos H = \cos\left(H - \frac{a}{2} - \frac{a}{2}\right) - \cos\left(H - \frac{a}{2} + \frac{a}{2}\right)$$

$$= 2 \sin\frac{a}{2} \sin\left(H - \frac{a}{2}\right);$$

therefore $$\sin\delta = 2 \cos l \cos d \sin\frac{a}{2} \sin\left(H - \frac{a}{2}\right);$$

and hence $$2 \sin\frac{a}{2} \sin\left(H - \frac{a}{2}\right) = \frac{\sin\delta}{\cos l \cos d}.$$

Now a and δ being small angles, we may without sensible error put $2 \sin\frac{a}{2} = a$, $\sin\delta = \delta$, and $\sin\left(H - \frac{a}{2}\right) = \sin H$, and we have

$$a = \frac{\delta}{\sin H \cos l \cos d}; \quad \ldots\ldots\ldots\ldots\ldots (4)$$

but $$\cos H = -\tan l \tan d = -\frac{\sin l \sin d}{\cos l \cos d},$$

therefore

$$1 - \cos^2 H = \sin^2 H = \frac{\cos^2 l \cos^2 d - \sin^2 l \sin^2 d}{\cos^2 l \cos^2 d}$$

$$= \frac{(\cos l \cos d - \sin l \sin d)(\cos l \cos d + \sin l \sin d)}{\cos^2 l \cos^2 d}$$

$$= \frac{\cos(l+d) \cos(l-d)}{\cos^2 l \cos^2 d},$$

and $$\sin H = \frac{\sqrt{\cos(l+d) \cos(l-d)}}{\cos l \cos d};$$

Hence, by substitution in (4)—

$$a = \frac{\delta}{\sqrt{\cos(l + d)\cos(l - d)}} \quad \ldots\ldots\ldots\ldots \quad (5)$$

Taking δ at its mean value of 26′ in arc or $1^m.73$ in time, we may now form by means of the formulæ (1) and (5) such a table as the following for any given latitude :—

TABLE A.

Semi-diurnal Arcs, &c. for every degree of Declination, North or South, for the Latitude of Bombay, 18° 54′ *N.**

Decl.	Semi-diurnal Arc H. N. Decl.	Semi-diurnal Arc H. S. Decl.	Diff. for 10′ of Decl.	Cor. for Hor.par. &c. $\delta = 26'$.	Decl.	Semi-diurnal Arc H. N. Decl.	Semi-diurnal Arc H. S. Decl.	Diff. for 10′ of Decl.	Cor. for Hor. par. &c $\delta = 26'$.
	h. m.	*h. m.*	*m.*	*m.*		*h. m.*	*h. m.*	*m.*	*m.*
0°	6 0·000	6 0·000	·228	—1·832	15°	6 21·055	5 38·945	·247	—1·905
1	1·368	5 58·632	·229	1·832	16	22·536	37·464	·250	1·914
2	2·740	57·260	·229	1·833	17	24·034	35·966	·252	1·926
3	4·112	55·888	·229	1·835	18	25·548	34·452	·255	1·938
4	5·487	54·513	·230	1·837	19	27·081	32·919	·259	1·951
5	6 6·865	5 53·135	·231	—1·840	20	6 28·634	5 31·366	·262	—1·965
6	8·249	51·751	·231	1·843	21	30·208	29·792	·266	1·980
7	9·637	50·363	·232	1·848	22	31·805	28·195	·270	1·995
8	11·032	48·968	·234	1·852	23	33·426	26·574	·274	2·002
9	12·434	47·566	·235	1·858	24	35·072	24·928	·279	2·029
10	6 13·844	5 46·156	·237	—1·864	25	6 36·747	5 23·253	·284	—2·048
11	15·264	44·736	·238	1·871	26	38·451	21·549	·289	2·067
12	16·693	43·307	·240	1·878	27	40·187	19·813	·295	2·088
13	18·135	41·865	·242	1·886	28	41·956	18·044	·301	2·110
14	19·588	40·412	·244	1·895	29	43·760	16·240	·307	2·134

Now the moon returns to the same meridian in a mean period of

$$\frac{29{\cdot}5305887}{28{\cdot}5305887} = 1^d.0354992.$$

Hence the semi-diurnal arcs in the preceding table, after being corrected for parallax and refraction, must each be multiplied by the co-efficient 1·0355 in order to give average lunar semi-diurnal arcs.

* This table will serve for computing the times of Sunrise and Sunset, the correction for Refraction and Parallax being in that case additive, and δ varying from 29′ to 34′.

Thus are obtained the numbers in Table I. computed for every 30′ of declination with the latitude 18° 54′N.

It only remains to apply the small corrections required for variations in the angular motion and in the difference of the horizontal parallax and refraction—the latter, in this latitude, never amounting to more than half a minute.

If p = any horizontal parallax,

r = the refraction at the same time,

and $\delta' = p - r$;

we have for the correction—

$$-\frac{0^m.069(\delta'-26')}{\sqrt{\cos(l+d)\cos(l-d)}} = -0^m.04(\delta'-26')a.$$

This is tabulated for $\delta'-26' = 1'$ in Table I.;

And if Δ, the difference in minutes of the times of two successive transits of the moon, or her mean motion from the sun in the intervening lunar day, the correction will be—

$$+ 0^m.0402557\ H\ (\Delta - 50^m.472),$$

and is tabulated with the arguments H and Δ in Table II.

For the correct time of the moon's transit at Bombay, we have the longitude $4^h\ 51^m.3$ E. or $-\frac{1}{5}$ of the circumference very nearly. Hence if A and B be the times of two successive transits at Greenwich, Δ their difference, and Δ'_2, Δ''_2, the second differences opposite A and B respectively, then T, the time of transit at Bombay, is given by the expression—

$$T = B - \cdot 2022\left(\Delta + \frac{\Delta'_2 + \Delta''_2}{5}\right), \text{ or } B - \frac{\Delta}{5} \text{ very nearly,}$$

$$\text{or } T = A + \cdot 7978\left(\Delta - \frac{\Delta'_2 + \Delta''_2}{20}\right) + 24^h$$

$$= A + \cdot 7978\,(\Delta - \tfrac{1}{10}\Delta_2) + 24^h.$$

where $\Delta_2 = \frac{1}{2}(\Delta'_2 + \Delta''_2)$.

Hence, if from the first difference $\frac{1}{10}$ of the mean of the second differences be subtracted (algebraically), and the result used as the argument in the following table, the correction there found, when added to the time of the Greenwich transit A, will give the time of the moon's meridian passage at Bombay following, or next day.

TABLE B.

Correction for the time of the Moon's transit in Longitude 4h. 51·3m. E.

$\Delta - \frac{\Delta_2}{10}$	Correction. 24h.	$\Delta - \frac{\Delta_2}{10}$	Correction. 24h.	$\Delta - \frac{\Delta_2}{10}$	Correction. 24h.	Proport. Parts.	
						Δ	Cor.
m.	m.	m.	m.	m.	m.		
38	+30·32	47	+37·50	56	+44·68	0·1	·08
39	31·11	48	38·29	57	45·47	·2	·16
40	31·91	49	39·09	58	46·27	·3	·24
41	32·71	50	39·89	59	47·07	·4	·32
42	33·51	51	40·69	60	47·87	·5	·46
43	34·31	52	41·49	61	48·67	·6	·48
44	35·10	53	42·28	62	49·46	·7	·50
45	35·90	54	43·08	63	50·26	·8	·64
46	36·70	55	43·88	64	51·06	·9	·72

Example.

Given the following times of transit from the Nautical Almanac, to find the times of the moon's transit at Bombay for the 28th and 29th August 1863, and of her setting in the morning and rising in the evening of the 29th, the horizontal refraction in the morning being 30·1, and 29·3 in the evening.

1863, August 26th	10h.	9·3m	Δ_1	
			+ 56·6	Δ_2
27th	11	5·9		—2·1
			54·5	
28th	12	0·4		—1·9
			52·6	
29th	12	53·0		—1·1
			51·5	
30th	13	44·5		

Then 1st. $\Delta = 54{\cdot}5 + \frac{2{\cdot}1 + 1{\cdot}9}{20} = 5{\cdot}47$

Transit at Greenwich	August 27th	11h. 5·9m.
Correction by Table B for Δ = 5·47.....		43·6
Transit at Bombay, next day	August 28th	11h. 49·5m.

2nd.—For the 29th, $\Delta = 52{\cdot}6 + \frac{1{\cdot}9+1{\cdot}1}{20} = 52{\cdot}75m.$

Transit at Greenwich	August 28th	12*h.*	0·4*m.*
Cor. for 52 =41·69, and for $0^m{\cdot}75 = 0{\cdot}6$, 41·49+·6 =			+42·09.
Time of Mer. passage at Bombay ..	August 29th	12*h.*	42·5*m.*

3rd.—Moon's transit at Bombay August 28th ..... 11*h.* 49·5*m.*

„ „ „ 29th..... 12*h.* 42·5*m.*

Difference ..... Δ = 53*m.*

Mean Time of transit	August 28th	11*h.*	49·5*m.*
Longitude E. from Greenwich		4	51·3
Greenwich Mean Time.....		6	58·2
About 6*h.* after this, the moon's decl. is about 4° S., for which Table I. gives		+ 6	5
Sum Gr. M. T. of setting nearly.....		13*h.*	3·2*m.*

For Aug. 28th 13*h.* 3*m.* the Nautical Almanac gives the moon's declination 4° 6.′4 S. and the hor. par. = 60.′5.

Now for 4° 6.′4 S., Table I. gives the hour angle.	6*h.*	4·89*m.*
Hor. Par.—Refr.—26′ = 60.′5—30.′1—26′ = 5.′4, and by Table I. ·073×5·4=		—0·39
Δ = 53*m*, and H = 6*h.* 5*m.*, for which Table II. gives		+0·62
Corrected hour angle of setting	6	5·1
Apparent time of Mer. pass. preceding.....	11	48·4
Equation of time		+ 1·0
Moon sets at Bombay	August 29th	5*h.* 54·5*m.*

4th.—Moon's Meridian passage	August 29th	12*h.*	42·5*m.*
Longitude E.....		—4	51·3
Gr. Mean Time.....		7	51·2
About 6*h.* before this the decl. is 1° S. and Table I. gives.....		6	9
Remainder, Gr. Mean Time of rising nearly		1	42

Decl. at 1*h*. 42*m*. is 1° 16′5 S., and Hor. par. 60′2.		
For Decl. 1° 16′5 S., Table I. gives	6*h*.	8·91*m*.
(60.′2—29′3)—26′ = 4′9, and by Table I. —4·9×·073.....		—0·36
For Δ = 53*m*. and H = 6*h*. 9*m*. Table II. gives		+0·62
Corrected hour angle of rising.....	6	9·17
*Apparent** time of Mer. passage following	12	41· 7
„ „ rising	6	32·53
Equation of time		+0· 9
Mean time of rising at Bombay, Aug. 29th P.M.	6	33· 4

Proof.

Moon's R. A. Aug. 29th 1*h*. 42*m*. Gr. M. T.	22*h*.	58·61*m*.
Sun's ditto.....	10	21·93
Diff of R. A. of sun and moon.....	12	28·68.
Semidiurnal arc by Table A, for 1°16′·5 S. 5*h*. 58·25*m*.		
Refraction—Parallax=— 26′0 — 1·83		
4·9 — ·34		
	5	56·08
Subtract from Diff. of R. A	6	32 ·6
Equation of time.....		+0 ·9
Moon rises, as before, at Bombay ..... at	6*h*.	33·5*m*. P.M.

* The variation in the equation of time in 6 or 7 hours is always so trifling, that the mean time may always be used in the computation without appreciable error.

[*Table*

TABLE I.

Lunar Semi-diurnal Arcs for Lat. 18°54′ *N.*

Declin. Degrees.	N. Declination.		Var. for 10′ of Decl. +	South Declination.		Var. for 10′ of Decl. —	Var. for δ′-δ=1′.
	0′.	30′.		0′.	30′.		
	h. *m.*	*h.* *m.*	*m.*	*h.* *m.*	*h.* *m.*	*m.*	*m.*
0°	6 10·72	6 11·43	0·236	6 10·72	6 10·01	0·236	—0·073
1	12·14	12·85	·236	9·30	8·59	·237	·073
2	13·56	14·27	·236	7·88	7·17	·237	·073
3	14·97	15·68	·237	6·46	5·75	·238	·073
4	16·40	17·11	·238	5·04	4·32	·238	·073
5	6 17·82	6 18·53	0·238	6 3·61	6 2·89	0·239	—0·073
6	19·25	19·96	·239	2·17	1·45	·240	·073
7	20·68	21·40	·240	0·73	0·00	·242	·074
8	22·12	22·84	·241	5 59·28	5 58·55	·243	·074
9	23·56	24·29	·242	57·82	57·08	·244	·074
10	6 25·02	6 25·75	0·244	5 56·36	5 55·62	0·246	—0·074
11	26·48	27·21	·245	54·88	54·14	·248	·074
12	27·95	28·69	·247	53·40	52·65	·250	·075
13	29·44	30·18	·249	51·90	51·14	·252	·075
14	30·93	31·68	·251	50·38	49·61	·255	·075
15	6 32·44	6 33·20	0·254	5 48·85	5 48·08	0·257	—0·076
16	33·96	34·73	·256	47·31	46·53	·260	·076
17	35·50	36·28	·259	45·75	44·96	·263	·077
18	37·06	37·84	·262	44·17	43·37	·266	·077
19	38·63	39·42	·265	42·57	41·76	·270	·078
20	6 40·22	6 41·03	0·269	5 40·95	5 40·12	0·274	—0·078
21	41·84	42·65	·273	39·30	38·46	·278	·079
22	43·47	44·30	·277	37·63	36·78	·282	·079
23	45·13	45·97	·281	35·94	35·08	·287	·080
24	46·82	47·67	·286	34·22	33·34	·292	·081
25	6 48·53	6 49·40	0·291	5 32·47	5 31·57	0·297	—0·082
26	50·28	51·16	·296	30·68	29·77	·303	·082
27	52·05	52·95	·302	28·86	27·93	·309	·083
28	53·86	54·78	·307	27·01	26·06	·315	·084
29	55·70	56·64	·313	25·12	24·15	·322	·085

TABLE II.

Correction of the times of the Moon's Rising and Setting for variations of angular motion.

Retard of the ☾'s Mer. Pass.	Moon's Semi-diurnal Arc.							Diff. for 10*m.* of arc.
	5*h.* 0*m.*	5*h.* 20*m.*	5*h.* 40*m.*	6*h.* 0*m.*	6*h.* 20*m.*	6*h.* 40*m.*	7*h.* 0*m.*	
● *m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*
38	—2·51	—2·68	—2·84	—3·01	—3·18	—3·35	—3·52	—0·084
39	2·31	2·46	2·61	2·77	2·92	3·08	3·24	0·077
40	2·11	2·25	2·39	2·53	2·67	2·81	2·95	0·070
41	1·91	2·03	2·16	2·29	2·41	2·54	2·67	0·064
42	1·71	1·82	1·93	2·05	2·16	2·27	2·39	0·057
43	1·50	1·60	1·70	1·80	1·91	2·01	2·11	0·050
44	1·30	1·39	1·48	1·56	1·65	1·74	1·82	0·043
45	—1·10	—1·17	—1·25	—1·32	—1·40	—1·47	—1·54	—0·037
46	0·90	0·96	1·02	1·08	1·14	1·20	1·26	0·030
47	0·70	0·75	0·79	0·84	0·89	0·93	0·98	0·023
48	0·50	0·53	0·56	0·60	0·63	0·66	0·70	0·017
49	0·30	0·32	0·34	0·36	0·38	0·40	0·41	0·010
50	—0·09	—0·10	—0·11	—0·11	—0·12	—0·13	—0·13	—0·003
51	+ 0·11	+ 0·11	+ 0·12	+ 0·13	+ 0·13	+ 0·14	+ 0·15	+ 0·004
52	0·31	0·33	0·35	0·37	0·39	0·41	0·43	0·010
53	0·51	0·54	0·58	0·61	0·64	0 68	0·71	0·017
54	0·71	0·75	0·80	0·85	0·90	0·95	0·99	0·024
55	0·91	0·97	1·03	1·09	1·15	1·22	1·28	0·030
56	1·11	1·18	1·26	1·34	1·41	1·48	1·56	0·037
57	1·31	1·40	1·49	1·58	1·66	1·75	1.84	0·044
58	+ 1·52	+ 1·62	+ 1·72	+ 1·82	+ 1·92	+ 2·02	+ 2·12	+ 0·051
59	1·72	1·83	1·95	2·06	2·17	2·29	2·40	0·057
60	1·92	2·05	2·17	2·30	2·43	2·56	2·68	0·064
61	2·12	2·26	2·40	2·54	2·68	2·83	2·97	0·071
62	2·32	2·48	2·63	2·78	2·94	3·09	3·25	0·077
63	2·52	2·69	2·86	3·03	3·19	3·36	3·53	0·087
64	2·73	2·90	3·10	3·27	3·45	3·63	3·81	0·090
Diff. for 1*m.* of Retard.	+0·201	0·215	0·228	0·242	0·255	0·268	0·282	

ART. V.—*Remarks on the Tribes, Trade, and Resources around the shore line of the Persian Gulf.*—By Lieutenant Colonel LEWIS PELLY. Presented by Government.

[Read before the Society, September 17th, 1863.]

I SUBMIT some superficial remarks, based on personal observation and hearsay, concerning the tribes, trade, and resources around the shore line of the Persian Gulf.

2. As you enter the Gulf, the town of Bunder Abbas, with its adjacent historic Island of Ormuz, lies on your right, and Cape Mussendom on your left.

3. As you leave the Gulf, after traversing its entire length North-westward, and pass up the Shat-ul-Arab or Busreh River, the town of Busreh is on your left and the fort of Mahomera on your right.

4. All the territory from Mahomera to Bunder Abbass is directly or indirectly under the Persian Government. And all the territory from Cape Mussendom to Busreh, is either directly or indirectly under Turkey, or else is held by independent Arab Chiefs.

5. A map is annexed, showing the several jurisdictions and their principal ports all round the Gulf: beginning at Mahomera and ending at Busreh.

6. These jurisdictions may be classified, and their ports named as follows:—

1*st*.—Territory owning the sovereignty of the Shah of Persia, but administered by its Native Arab Chiefs; subject, however, to visitation from the Finance Department of the Persian Prince Governor at Shuster.

The Chaab Arabs from the Karoon to the Hindeean, including Mahomera, Dorack, Bunder Mashoor, Hindeean, and Zeitoon.

Minor Arab settlements to the Southward of the Hindeean, but which are in this report included under Class II. for specified reasons.

SKETCH
of the
GULF OF PERSIA.
Showing the seven Classes of Jurisdiction enumerated in my letter
No. 67 of 15th April
1863
CLASS No 1
CLASS No 2
CLASS No 3
CLASS No 4
CLASS No 5
CLASS No 6
CLASS No 7
CHAAB ARABS
PERSIA
ARABIA
GULF OF PERSIA
Bushire
Bushire R.
Reshire
Reshire R.
Kharack
Kharack R.
Kharack I.
Karrack
Karrack R.
Karrack I.
Lingah
Lingah R.
Kishm I.
Kishm R.
Ormuz
Ormuz I.
Queis
Queis I.
Bahrein
Bahrein I.
Grane
Grane R.
Abu Shehr
Abu Shehr R.
Abu Shehr I.
Bushire Roads
Reshire Roads
Kharack Roads
Lingah Roads
Kishm Roads
Ormuz Roads
Queis Roads
Bahrein Roads
Abu Shehr Roads
Grane Roads
Persian Gulf Entrance
Strait of Ormuz
Mouth of the Euphrates
Mouth of the Tigris
Mouth of the Persian Gulf
Entrance to the Persian Gulf
Entrance to the Gulf of Oman
Entrance to the Strait of Ormuz
Entrance to the Mouth of the Euphrates
Entrance to the Mouth of the Tigris
Entrance to the

2nd.—Territory directly under the local officers of the Shah, and of which the Customs and Revenues are either contracted for by Her Majesty's Governors, or accounted for in detail to the Persian Treasury.

Bushire, Congoon, Asseeloo, Nabend, Nakheeloo, Cheroo, Khelat, Charrack, Mogoo, and Lingah.
There are many other small hamlets along this line, but they are unworthy of particularization.

3rd.—Territory farmed by the Shah to the Sultan of Muscat for a term of years, under a Treaty entered into beween the late Imaum of Muscat and His Majesty in 1856.

1st.—Bunder Abbass, with its adjacent district Northwards to a point near Lingah, and Southwards to a tract whose political jurisdiction is not determined, under Treaty entered into and recognised by every body concerned. *2nd.*—Island of Kishm and dependencies.

4th.—Territory directly under the Sultan of Muscat.

The Mussendom promontory, inclusive of Khoomzar and Khussub. The frontier between Muscat and Ras-ul-khyma Territory, is near where the plain and mountains meet at Shaam.

5th.—Territories held by those independent Maritime Arab Chiefs formerly the pirates of the Gulf, now partially commercial, and bound by the terms of a permanent truce to keep the peace at sea; the English Resident in the Gulf being mediator and quasi-guarantee for the observation of this truce by all the subscribing Chiefs, more especially during the season of diving on the Pearl Banks.

Shaam and Kuleela.	Heira.
Ramse, Ras-ul-khyma.	Shargah and Fasht.
Jazirath-ul-Hamra.	Khan.
Amulgavine.	Debaye and Aboothabee.
Ejmaun.	

6th.—Territories recognising the suzereignty of the Turkish Government, but practically independent under their own Chiefs.

Kateef or Nejd Territory, Koweit or Grane.

7th.—Territory directly under the Pashas of the Turkish Government.

Busreh Zobeir.
Faon with intermediate small ports along right bank of the Busreh River.

7. The largest territory falling under the first class is that of the Chaab Arabs. It may be generally described as a vast,

The Chaab Arabs.

well-watered, and fertile plain, contained between the lines of the river Karoon to the North and the Hindeean river to the South; and sloping imperceptibly from the lower spurs of the Khogiloo mountains, and that upper portion of Khuzistan, which lies along the Ram-Hormuz* and Shuster route, South-westward to the Huffar cutting, and the Bamsheer river: to the Westward of which channels the Chaab Territory further extends (under a separate branch tribe at Mahomera) to the left bank of the Shat-ool-Arab.

8. The Chaab plain† is intersected in its entire length from the Eastward (Northerly) to the head of the Persian Gulf by one fine stream, which, receiving affluents from the mountains at various points lying between Ram-Hormuz and Behbehan, flows through the Chaab Territory under the name of Jerahee; throwing off numerous natural, improved, or wholly artificial water channels, more especially from its right or Northern bank. The Jerahee is navigable for boats of 4 or 5 tons throughout its length, until within some 12 miles of Ram-Hormuz. When it reaches nearly the latitude of Dorack (or Fellahiah), the chief town of this territory, it supplies a broad canal, which, after flowing about 6 miles, passes through Dorack, throwing off several agricultural water courses from both sides, or wasting itself in floods, until it is reduced to a small canoe channel, which opens on the Huffar or lower Karoon, and so communicates with Mahomera and the main river. Two ancient canals coming from the Karoon, cross the Dorack canal at right angles and flow South towards the sea. They are named respectively Mourad and Sooleymanya.

9. After passing the point (called Kazenah or the sluices) whence the Dorack water is supplied, the Jerahee curves South, passing Zoobeea within one fursac of Dorack, there throws off several more broad off-shoots, and then flows onward to the sea, having its port at Boozeah. Zoobeea is the point to which small sea-going craft come up for the supply of Dorack, and goods are carried to and from Zoobeea and Dorack by land.

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* Called in common parlance Hormuz.

† A sketch of the Chaab plain, and of the coast line in general round the head of the Gulf, has now been very carefully prepared by Dr. Colvill, from our recent marches round that line. I suggest a reference to that sketch, which accompanies my report No. 65, of this day, sent by this opportunity.

10. Tracking from the Huffar up the canoe channel towards Dorack, you can easily see the sails of boats passing up the Karoon. But on reaching Dorack, the Karoon is distant some nine fursacs. The Jerahee, at the sluices, and for the few miles I passed further up it, has a mid-channel of 8 feet in depth; gently curving, and well defined banks, irregularly fringed with date trees; and showing on either hand a well farmed breadth of land, with cattle and horses; the lower lands on the right bank over towards the Karoon line are in rice.

11. Bunder Mashoor is a sea port of the Chaabs, and distant from Dorack from 30 to 40 miles in an ESE. direction. And an irregularly curved line, passing a little within Mashoor, through a point a little lower down the canoe canal than Dorack, and so rounding to the left bank of the Karoon, would, during the winter or inundatory season, trace the blending of the grassy plain with swamp or flooded land. Indeed, as you pass up the Dorack canoe channel, your horizon is bounded by flooded land, whether you look towards the Karoon or towards Mashoor and the Gulf line. It seems that the towns in fact have been built on the margin of the flood, and it is needless to add, that as the water subsides, these towns and the pasture lands so opened up to the wandering tribes are poisoned by malaria.

12. Still riding in a general ESE. direction from Bunder Mashoor to Hindeean (being the sea town on the river of that name), you are on the same vast green plain; here rough with low brushwood, there dotted with the tents and flocks of the Arabs. This year, the rain being unusally scant, the grass was short; fit indeed for sheep, but not for cattle. I was informed however, that in ordinary seasons the grass is above a horse's knees. Barley was to be bought. But the straw of last year being exhausted, and that of this season not yet cut, I was hard pushed to find it anywhere in the Chaab country, and held myself fortunate to collect some of inferior quality at Dorack, and carry it not only to the Hindeean but to Bunder Dillum.

13. Hindeean is one of two entrepôts (the other being Dillum) for the Behbehan line of trade. At the town of Hindeean the river is unfordable; I found no ferry-boat, and was lucky in getting my baggage across in a chance bugla lying in the river. The Hindeean is navigable for light boats and canoes to within a short distance of

Behbehan. Zeitoon, formerly Zeidoon, is a central point higher up the stream, and distant 10 fursaes from Hindeean, where trade from Hindeean and Dillum converges. Goods go up by land, passing to Deh Moollah, then Arab, and then Zeitoon. These three marches are level, but the fourth and last march of 5 or 6 fursaes, from Zeitoon to Behbehan is stony and through the lower spurs of the mountain range.

14. The view looking inland from Behbehan is fine. The stream a hundred yards wide, deep, between high steep soil banks; a noble plain on either side. An old cedar tree or two and an old tomb break the middle ground, backed by reddish, sulphurous-looking, castellated, low ridge of hills, behind which a higher deep indigo range, and far in the distance, overlooking all, the snowy peaks of the Khogiloo tribes.

15. Crossing the Hindeean, and moving South-east, the grass plain becomes barren, and covered with a saline efflorescence, then pierced by salt water creeks, round the heads of which are strewn the ruins of Guebre, or as the natives call them *Hindoo* buildings. The plain then contracts, rugged spurs of the hills coming finally down to within 3 or 4 miles of the sea, until you reach the narrowest neck, at the frontier village of Sheikh Abool Sheikh of the Chaabs, or Shah Abool Shah of the Persians.* This village was the site of a Guebre Temple, or other holy place. It is now, like so many of its fellows, an Imam Zadeh. The village possesses all the essentials of vileness, filth, and ruffianly rascality, viz. the congregation of a set of ill-conditioned semi-barbarians, on an ill-favoured spot, for the guardianship of a shrine, and exempted on condition of such office from all taxation, supervision, and law.

16. I subjoin a statement of the principal Chaab tribes: but the numbers of their fighting men are I think overstated.

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* It is remarkable, that those shrines which date from a period anterior to that of the Prophet, and which had previously been consecrated as Fire Temples, Lingam Rubbers, or Poojah places, &c., have since been confirmed as shrines or places of pilgrimage by both Soonees and Sheeahs. Whereas those shrines which are now resorted to by only one of the two principal sects of Islamism, date from a time subsequent to that of the Prophet's birth. Again, where a shrine had been resorted to by infidels, and subsequently seized by the Moslems, the country in which it was situate remaining the frontier between the two religions, such shrine continued to be resorted to by the old infidels, and by the Mahomedan invaders and their converts.

Alboogbesh, Chief Moraid.....6,000 grown men, Boozeeah their principal town.
Asarkeerah, Chief Zair Kraidee. 4,000 grown men, Oushar near Boozeeah.
Mukasebah, Chief Saadoon ....2,500 grown men, Anayetee more S. & E.
Albooalee, Chief Saadoon .....2,500 grown men, on a creek, no name.
Sowayhat, Chief Showash.....2,500 grown men, do. do.
Almukhudum, Chief Shureeb ..4,500 grown men, Khoot near Dorack.
Al Khanaferah, Chief Hajee Hamdan. 5,000 grown men, on road to Dorack from Mahomerah.
Bhawee, Chief Akheel..... 8,000 grown men, on the Jerahee creek or mouth.
Zoorgan, Chief Jubbur ..... 8,000 grown men, on pastoral grounds.
Sherayfat, Chief Meer, Muhanna.....10,000 grown men, Hindeean and on the plains.
Amoor, Chief Shooheetee .....10,000 grown men, wandering and pastoral.
Beni Khaled, Chief Shadee ..... 5,000 grown men, ditto ditto.

These tribes are scattered throughout the pasturage during winter and spring, and concentrate at or near Fellahiah towards summer for provisions and trade.

17. It is interesting and necessary, when considering the Arabs, to distinguish between a series of grades towards civilization in which they may at present be found. There is the Bedouin—wandering, pastoral, tent-loving, disdaining to trade, yet avaricious, and willing to sell his ghee, his mutton, or his horse. But the Bedouin is always found in wide and open wastes, unpressed upon by adequate exterior power. Yet even the Bedouin bends to circumstances. He accepts the region allotted for his pasture grounds. Plunder has its laws, and vengeance its chivalry. If he will not trade, he has still wants, and suffers the presence of a Jew or Saleebah,* as the Afghan suffers that of the Hindoo.

18. A little higher in the scale you find, as with the Chaabs, the original wandering pastoral Arab, in a district where he is pressed upon from without, and where boundless plunder and roaming are restrained by exterior force. The Arab then partly turns to agriculture

* I saw some men of this tribe at Koweit and elsewhere. They worship the cross, (Saleb) and perform many ceremonies more nearly allied to the corruptions of Asian Christianity than to Islamism. Men and women dance round a sort of May Pole. They wear a carter's smock coming down to the feet, and which, like a boy's pinafore, ties behind. They possess a beautiful breed of donkeys, which they ride, without girths, upon a saddle made like a cottage wooden chair bottom. They squat on this seat, and twist their legs over a pummel peak; crossing them over the donkey's neck. They seem to prize their saddles as an Arab does his mare; and would not sell them. They seemed a merry, quick-witted, disreputable lot, with retrouse noses and Irish features. There they stood, eyes twinkling, (legs and hands on the fidget,) and pelted as with the peelings of their fun.

and for this he must in some degree settle. Society harmonizes to this level. Trade is possible; corn is sold; abbas are woven and exported; dates are planted; the appetite for trade grows by what it feeds on; huts of reeds replace tents; and one sees in their feeble efforts at reed ornamentation, and in their rough twisting of thick reed rope for their bunds, the possible germ of some of the architectural efforts of our own savage ancestors. Man at first accepts from Nature what she spontaneously affords: and feebly, through thousand of years, thinks towards artificial means.

19. Yet higher in the scale, you find the Arab flourishing as an all experienced and wealthy merchant in a town, or administering a well ordered and comfortable rural district.

20. What recurs to one in passing among these people is, that here before you is society in the making, or in its transitional state towards civilization. It is probable that the law under which human society now evolves, is that under which it has always evolved. The circumstances around you may then be data for the elucidation of a true theory. They are at least facts fresh from nature.

21. As to the political condition of the Dorack territory, it is really tributary to Persia, paying I believe a considerable sum into the Shuster Provincial Treasury. Its element of greatest commercial strength and military weakness lies in its bountiful supply of water. It would be difficult to find a territory of equal extent, where fresh water containing sufficient silt, is poured along the plain in all directions through channels so numerous and so easily manageable. But it was by damming the exits of this water towards the sea, that the Persians flooded the country and reduced the Chaabs.

22. The district of Mahomera originally formed part of the Dorack Chieftainship. But the present Sheikh of Mahomera separated his clan, fostered the naturally excellent position of his fort for commerce, and has since remained at feud with his old Chief. When I was at Dorack, both Sheikhs had been called before the Prince Governor for the settlement of their mutual grievances.

23. As to the commerce of the Chaabs it is limited, and flows in different channels, according to the season of the year; some of it reaches Mahomera *viâ* the Huffar, and is mixed up with the trade of that port, which in turn is sometimes included under the general trade

of the Shat-ool-Arab or Busreh line. The wealth of Mahomera as of the Shat-ool-Arab in general consisting mainly in dates.

24. Dorack itself exports some wool and abbas (the Arab cloak). Of rice also about 600 Karehs (each Kareh 100 Hashem maunds of 124 lbs. each). It possesses fine reaches of date groves along its streams. But these are wholly for home consumption.

25. The principal sea ports of the Chaabs are Bunder Mashoor and Hindeean. And the total duty collected on the exports and imports at each of these open towns may be about 40,000 Krans, or something less than 20,000 Rupees, eventually paid into Shuster.

26. The exports from Bunder Mashoor may be approximately analyzed as follows:—

Wool, to the value of one lac of rupees, shipped to Koweit or Bushire for ultimate transport to India.
Grain, mainly wheat and barley, to the value of 22,000 rupees.
Rice, from the Jerahee and Ram Hormuz fields, to the value of 10,000 rupees.
Rogun to 5,000 rupees in value for Koweit and Busreh.
Some 10,000 sheep per annum are shipped for Busreh and Koweit also.
Grain pays an export duty of 32 Krans per Kareh.
Wool 32 Krans on the 1,000 lbs. weight.
Rogun ½ Kran per Dubbeh.
And each sheep ¼ Kran.

27. The imports at Bunder Mashoor are—

Piece Goods to the value of 50,000 Krans, paying a duty of 2 Krans on an average of 10 yard pieces per 20.
Dates, 10,000 Karehs, paying 5 Krans per Kareh.

28. Hindeean imports.

About 1,000 Karehs of Dates from Busreh, each Kareh paying 5 Krans duty.
And Piece Goods to the value of 20,000 Krans.

29. The exports of Hindeean may be—

Grain, mainly Wheat and Barley, to the value of 200,000 Krans, coming down from the Behbehan and Hormuz lines, and paying a duty of ¼ Kran per Hashem maund.
1,00,000 Krans worth of Wool from the upper country.
10,000 Krans worth of Rogun. And some 10,000 sheep paying ½ Kran export duty each.

30. As to a possible development of trade in Chaab, I am of opinion that this will always be confined to the territory of Chaab itself, and to the provinces of Shuster and Behbehan. The passes leading into the plateau of Persia from these points may possess strategic advantages, but they are not lines that trade could work to a profit in competition with Bushire, Abbass, and Baghdad. Rice,

corn, ghee, and the products generally of semi-pastoral and semi-agricultural tribes enjoying a rich soil and fine water command, are what might be expected from the territory contained between the Karoon river, the Bahktyari, and Khogiloo mountains, the Hindeean, and the Bamsheer. Dates of course might form an item and be grown, as might also cotton over a large area.

31. I consider the Chaab* territory by no means an easy one to traverse.

My baggage animals were delayed nearly a fortnight at Mashoor, unable to reach Dorack. The direct road to Dorack from the Huffar was quite impassable, when I dragged in a canoe from Mahomera to Dorack. There is a circuitous road going round near the Karoon, which leads from Dorack to the Huffar, but even that is almost impassable in the wet season. During the subsidence this territory would be fatal to horses and men whether from miasma or the marsh insects. Grass is plentiful over boundless plains in the spring of favourable years. But in dry years your horse may famish. For the old chopped straw of last year is out, the grass is too short for a horse to crop, and young corn is findable only in patches near the towns.

32. The water is brackish along the entire line, unless when drawn from the river: that of the Hindeean and Huffar is delicious. The water in the Dorack canal, through the marsh portion of it, is rough and distasteful. It is reputed also unwholesome, especially during the summer months.

33. In former times, a series of circles of Arab villages, lying along the coast to the Southward of Hindeean, would have fallen under the

* The Chaabs, like some other Arab tribes settled along the Persian Coast of the Gulf, have become Sheeahs. They are partly Persianized also in costume and habits. An old Soonee observed to me with regret, that these Chaabs should wear a Syud's dark green turban, and fold angle with tea urns and uniforms. The Aseel Arab of the other river bank would never intermarry with a Chaab. But a Chaab would not only marry thence if he could, but accepts also a Persian in his bed. It is very amusing as you cross the head of the Gulf, to hear the Arab apologizing for some ill-hap, by saying that the offender is a Mogullee, a Sheeah; while the Persian excuses all gaucherie by the nasal words, they are Arabs, goats. A young Sheikh, who was hawking in the desert with me, explained a miss-flight by saying that his bird was a Mogullee. Had he been bred a Soonee he would never miss. I noticed, however, that the hawk dined hastily off his first Ooboura. This lad told me also the best way to hawk as to raid, was for two people to sit dos a dos on a camel: thus, as it were, giving the birds assurance of a man looking before and after.

class of territories which, though inferior in size and power to that of the Chaabs, were yet tributary to Persia, but administered by their native Chiefs or Sheikhs.

34. At present, however, all these settlements have fallen so much under the jurisdiction of Shiraz or Bushire, and are so intermingled with their affairs, that it seems preferable to notice these settlements under the heading of territory directly under the local officers of the Shah.

35. I pass accordingly to the second class, of which the nearest port to the Chaab Territory is that of Deelum, situate a few miles below Shah Abool Shah, above alluded to. Bunder Deelum is under the Government of Bushire; and the constitution of this sea board provincial government is somewhat complex. Down to a period of recent date, Bushire was, like other ports along the coast, governed by its own Sheikhs. Eventually the Bushirees fell out with the neighbouring tribes of the Dashties and Tungistoonees. Persia availed herself of the dissension to press on Bushire, establish a government there, and reduce both Dashties and Tungistoonees, together with some minor tribes, such as the Rohillas immediately around the Bushire creek, to a condition subordinate to Bushire.

36. At the present moment the government extends from Deelum on the North to near Congoon on the South; embracing a series of petty tribes, both Persian and Arabic, living in their own circles of villages, and interfered with by the central Government very much in proportion to their several means of resistance.

37. Southward from Congoon to Lingah, both inclusive, lies a chain of coast villages or small ports, whose revenues and affairs are subordinate to the Provincial Government of Fars at Shiraz; although the Governor of Bushire, in his capacity of High Admiral of the sea and ports (Persia does not possess a vessel of war), has charge of their maritime interests.

38. Thus, then, after leaving the Hindeean, we find a coast line from Deelum to Lingah more or less subordinate to Bushire, and of which the settlements and tribes from Deelum to Congoon may be approximately estimated at three-fourths Persians and one-fourth Arabs, and those from Congoon to Lingah one-fourth Persians and three-fourths Arabs.

39. As a general rule, the Arab circles of villages are farmed and administered by their own Sheikhs, who arrange their own civil disputes, and pay a lump sum of revenue per annum. Murder would be compensated by blood money; but the Sheikh would not send the murderer to Bushire for punishment. The Sheikh in turn would levy rent on the farmers by the cow. A cow is supposed to plough land enough for 4 maunds of seed barley and 4 maunds of seed wheat. A farmer asks his neighbour, for instance, how many cows he is sowing. The crop borne by a cow of land pays 15 Krans or so per annum in money, and one maund of wheat and one of barley apparently for Kurneh, or expenses in collecting.

40. But in case of a Persian circle of villages, or a Persian port, (not like the Dashties sufficiently strong to defend itself,) the Hakem or Sheikh, or Moollah, would be removed from his Government at the pleasure of the Bushire Governor. Criminals would be sent to Bushire; and revenue, if not punctually paid, would be levied by Mohussil, or failing this way, by force.

41. Reviewing the trade of this coast line as you pass along it from the North Southwards, the first port that comes under notice is that of Bunder Deelum. It is a small, busy, open town, clustering round a square fort. It is one of two points, the other being Hindecan, already remarked on, where sea borne trade lands to follow the Behbehan line; Zeitoon, the point of general trade, convergence on the Hindecan river, is distant from Deelum about 5½ fursacs. The stream is crossed by a raft, or in the low season at a ford a mile or two before you reach Zeitoon. Formerly Zeitoon returned 9,000 Tomans customs per annum, but now yields only 3,000 Tomans. This falling off, like that of both population and revenue, along the entire coast line from Mashoor to Congoon, is attributed to the absence of attraction between the Government and the people, and to the consequent emigration or idleness of the latter. Deelum, like all other ports along this coast, is a mere entrepôt, and the number of its resident inhabitants does not adequately represent the extent of its commerce. Zeitoon is a fine agricultural district. The trade of Deelum may be roughly stated as follows:—

Vide paragraph 13.

Exports.

Wheat and Barley to the value of. 30,000 krans to Busreh, Koweit, and Lingah.
Wool to the value of .....100,000 krans to Bushire and Koweit for India.
Rogun Cherag to the value of .. 10,000 krans
Grapes and Raisins to the value of.20,000 krans to Koweit and Busreh.
Rogun to the value of ..... 30,000 krans

Imports.

Piece goods.....	150,000	Krans value	From Bushire and Koweit.
Sugar	50,000	ditto	
Tea	10,000	ditto	
Dates	50,000	ditto	Equal to 1,000 Karehs from Busreh.

These imports go to Behbehan and also Ram Hormuz.

The Customs receipts may be from 15,000 to 20,000 Krans per annum on both exports and imports together.

42. Between Bunder Deelum and the next port of Bunder Reegh, lie the traces of the ruins of an ancient port and of ancient cities of immense extent. This tract has been known as Genaweh from time immemorial. Its upper portion is a confused tumbling of low, grotesquely shaped sandstone and earthy hills ; in parts interesected with vertical lines of gypsum, cropping up like the jagged edges of broken plate glass, or strewn over the slopes like pieces of ice. Leaving this rugged, confused region, you emerge on the beautiful plain of the ancient Geramha, the chief town of Genaweh, whose extensive ruins still hillock the soil for miles around. Some Hindoo looking temples still stand on the outskirts towards the beach, with their acorn shaped domes of spiral brick or stone work, and with their invariable accompaniments of two or three Banyan trees, the only ones to be found in the country. The architecture of these temples, and of their neighbouring wells, seems still to tell of a time when Kafirs, whether Hindoos (as tradition asserts) or others, flourished on this plain. Perhaps from that Port of Grai, the wealth of the lowest layer of debris in yonder mounds, the earliest Geramha, was exchanged with that coming from Edom or Chaldea, through the earliest Geranhensis near the present Grane or Koweit. It has happened to me to wander over the traces of many ancient cities. But no reiteration of the scene ever mitigates the solemnity of its reflection or the gloom of its forebodings. Whatever may have been the histories of their rise and fall, one feels, in digging down these strata of silent homes, that they formed not one city, but successive cities ; each leaving a conglomerate

of what it used as its only record; each showing that man had come of age ere history began; and one and all revealing, as from the grave, the common doom of human power on earth.

43. To the South of the Geramha ruins lies the bed of a once abundant river, the Kuleel. It passed close under the walls of the city, with Fort Teesko, seemingly an old citadel, on its Northern side. A massive gateway stood on the Southern bank. The channel of the Kuleel is now a salt water creek. An earthquake changed the course of the fresh water stream at its source. And its dry or salty bed still explains the cause of the ancient prosperity, and present comparative desolation of the Genaweh plain. I picked up some spirally grooved cylinders of baked clay.* Tradition says they were what the Kafirs hurled from leathern slings when Geramha was attacked. It is possible war may as usual have aided time and nature in destroying art. The quickest destroyer of men is man.

44. Bunder Reigh is very inferior in size and importance to Deelum. It imports only for its own wants, and for those of its neighbourhood. It is not a port for any route to the interior. Its trade may be somewhat as below :—

Exports.

Wheat and Barley	20,000	Krans worth.
Wool.....	10,000	ditto.

Imports.

100 Karehs of Dates and Piece Goods to the value of 10,000 Krans; also a few miscellaneous articles for home consumption.

The gross of the Customs may be 10,000 Krans.

45. To the South of Bunder Reigh, and immediately North of Bushire creek, lies a flat, corn-growing circle of some ten Arab villages, known as Rohilla; indeed, it may be remarked, that coming Southward from the Chaab territories, the plain, there wholly pastoral, becomes gradually patched with corn, until towards Rohilla large breadths are found under the plough. A fresh water stream, fordable only in one or two places, runs through this district, which none the less depends solely on rain. It is traditioned that this Rood-hulla or Hulla river received a portion of the waters turned by the earthquake from the Kuleel river of Genaweh, the remainder of that stream having burst

* Called Gopals; they are picked up in other places along the coast.

Northward towards Behbehan, and found exits in the Hindeean (Ab Shereen), in an affluent of that river meeting it near Zeitoon, and in the Southermost tributary of the Gerahee.

46. Sheaf, a small port on the Northern shore of the Bushire creek, is a sea outlet for Rohilla produce, and is distant only some 3 miles from the nearest hamlet in this circle. The corn of these district,* being dependent upon uncertain and scant rain-fall, is sparely sown broad cast, and carelessly ploughed in with the old scratch. But there is little doubt that, under proper management of water, and free of restriction and unequal taxation, the country around the Bushire creek might export corn and cotton to a considerable quantity.

47. I come now to Bushire itself. And as this is the principal port in the Gulf, I append the least erroneous and most detailed statements I have been enabled to collect of its export and import trade, drawn up with care and diligence by Mr. James Edwards, the Head Accountant in this Presidency. These statements † may form a rough index to the general character of the trade of the remaining ports in these waters. But not only are similar statements not available for those other ports, but it is probable that, if procured, their submission might only tend to mislead. For the articles which would appear as imports by large craft at one port, might again appear as exports from this same place, and as imports again at some other point. And the data do not exist for analyzing these complications, and presenting a complete statement of the trade in the Persian Gulf, considered as a whole.

* These districts rear a good half-bred description of horse, half Persian, half Arab. They pass currently under the general name of the Chaab Arab horse. The principal defects of this half-breed are found in a small arm and falling off of the hind quarter. They are better roadsters than the pure Arab. But they lack his quietness, intelligence, and endurance. By re-crossing the Rohilla Chaab with a pure Arab, it is found that a good looking and serviceable horse of large bone and height is obtained. But, on the whole, no cross is a satisfactory animal. And he is never so gentlemanly, whether in manners or appearance, as the real Hamadanee, Saglair Khaltan, or Anezee.

† These statements have been framed by taking the opinions and estimates of several Native traders, upon the details of trade at the ports, and concerning the articles in which they were severally interested.

These estimates have then been reviewed by an intelligent and experienced member of a long established European Firm, and subsequenly considered by the Head Accountant.

I consider that, though not exact, they are sufficiently near approximations to correctness to prove serviceable guides.

48. I note below a list of the principal exports and imports of Bushire, obtained from independent mercantile sources:—

Exports from Bushire.

Cotton	60,000	Tabreez maunds.
Madder root	100,000	,,
Raw Silk	10,000	,,
Gall Nuts	7,000	,,
Almonds	50,000	,,
Raisins	50,000	,,
Tallow	30,000	,,
Tobacco	120,000	,,
Rosewater	6 to 20,000	Carboys.
Ditto	15,000	Flasks.
Assafœtida	3,000	Tabreez maunds.
Salep	1,200	,,
Gum Persia	25,000	,,
Wool	100,000	,,
Wheat	1,500,000	,,
Opium	4,700	,,
Ghee	10,000	,,
Cummin seed	40,000	,,
Bees' wax	4,000	,,
Dates	20,000	Baskets.
Gram	26,000	Tabreez maunds.
Carpets	5,000	Pieces.
Wine	500 to 1,000	Carboys.

Imports at Bushire.

		Rupees.
Cashmere Shawls to the value of		2,500,000
Cocoanut oil	,,	2,000
Preserves (Ginger)	,,	5,000
Sealing-wax	,,	1,000
Alum	,,	5,000
Piece goods, Europe	,,	600,000
Yarn, Europe	,,	35,000
Flints for Guns	,,	6,000
Lead	,,	7,000

		Rupees.
Tin, Pig	to the value of	70,000
Tin, Sheet	„	5,000
Stationery	„	2,000
Leather	„	4,000
Spices	„	50,000
Pepper.....	„	50,000
Sugar	„	950,000
Sugar-candy.....	„	40,000
Tea	„	80,000
Camphor.....	„	2,000
Coffee	„	40,000
Blackwood	„	30,000
Brazil wood.....	„	4,000
Iron.....	„	10,000
Sal Ammonia	„	6,000
Drugs	„	7,000
Steel.....	„	3,000
Glassware.....	„	7,000
Candles, wax	„	2,000
Gold cloth	„	75,000
Zinc.....	„	4,000
Quicksilver	„	4,000
Sundries	„	100,000
	Total Imports..... Rupees	4,706,000

49. An Abstract of the Bushire trade prepared last year is also subjoined :—

Abstract Statement of the estimated Exports and Imports at Bushire.

Exports to	Rupees.	Imports from	Rupees.
Bombay	1,000,000	Bombay	3,700,000
Java.....	350,000	Java.....	1,000,000
Jeddo	180,000	.....	.....
Total approximate Exports Rupees	1,530,000	Total approximate Imports Rupees	4,700,000

50. Some clue may be found to the trade of Bushire in the terms upon which it is farmed by the Governor. For the revenue system throughout is one of farming, the terms of the annual contracts remaining a constant quantity; while it is only the douceur that varies.

51. The revenues of the Bushire government then are farmed* for a gross amount of some 30,000 Tomans, of which 15,000 Tomans may represent the customs; and the balance octroi receipts, and land and pole tax from the tribes and villagers.

52. Suppose the Governor to clear 10,000 Tomans on the year, and 5,000 Tomans more to stick to the fingers of underlings. Take the low rate of 5 per cent. (being that of the most favoured foreign nation) as an average custom due on both exports and imports; and the gross value of the entire trade of Bushire, so estimated, would amount to 900,000 Tomans or about £4,50,000 Sterling.

53. Trade reaches Bushire from Batavia, Mauritius, and in part from India, in square-rigged vessels. But perhaps the bulk of the Indian trade comes in native craft of from 100 to 200 and 300 tons burthen.

54. A small portion of the imports are subsequently re-exported to other Gulf ports in a smaller class of sea-going native craft. But the large bulk of it finds its way into the interior of Persia by mule caravan. After reaching Shiraz it divides, a part passing to Yezd, and the remainder to Ispahan, with a sprinkling round these cities.

55. A caravan shows large, but there may be a good deal of bell tinkling under the pony's neck, without much wool or cotton on the mules' backs. It would take some 3,000 mules to carry off the cargo of a small vessel of 500 tons. And it is probable that a year's traffic, along a well-frequented Persian road, might be stowed away in the

* One of the consequences of this system of farming is, that the agriculturalist is called on for a much larger rent than the State receives from him. *E. g.*, A farms a Governorship from the Shah, for an amount B+C the douceur. A in turn farms his circles of villages: of which D takes one circle. D again sublets a hamlet or one of his villages to E, who deputes F to collect the rents. Each of course expects a profit on his contract. And consequently the agriculturalist, instead of having to pay the amount which benefits the state, B is called on for his share of B+C (+D+E's + F's profits). He cannot pay; F complains to E and E to A who is dunned for his contract sum from the capital. A gives to his subfarmers permission to collect revenue by force. This is done. Next year some of the peasants are fled, some of the land is lying waste. The country, in brief, is revenued as if the Government were to end with the expiry of the Governor's lease.

shipping of an average London yard. The imaginative mind of Persia attributes to this, her almost sole sea-port, an incomparable commerce. But the common place sense of an Englishman, weighs upon the facts of the terms of the farm from a Government not celebrated for generosity; of the paucity of square-rigged vessels in the roads there is at this moment not one of the straggling in from time to time of a single Bombay bugla, three parts in ballast, having dropped the bulk of her cargo at Abbass or Lingah; of the closing of the native craft trade with India during the South-west Monsoon; of Bushire being a town containing some 10,000 inhabitants only; of the paucity of fodder and supplies along the Shiraz road; of the smallness of the caravans, numbering from 50 to 60 mules; and finally on the fact that, when Bunder Abbass was blockaded a few years ago, and its trade thrown for the moment along the Bushire road, the price of carriage at Bushire to Shiraz, a distance of some 180 miles, rose from 15 or 17 Krans per mule to 80 Krans.*

56. The physical disadvantages of Bushire as a port are considerable. It is a roadstead only partially protected against the prevailing winds from the North-west. The anchorage is 4 miles from the landing place. Communication with shipping by boats is always slow either to or from the bunder, and is sometimes wholly cut off for days together during a strong North-wester.

57. The port enjoys a management differing from ours. Boats cannot go off after sunset, nor move to land cargo until the Manifest has been seen by the Governor.† English trade is rated under

* Of course carriage at Bushire being adjusted to its average trade, any sudden influx of extraneous goods would have temporarily raised the rates of carriage to an arbitrary maximum. Still, the distance to Shiraz being so short, and the rise so enormous in rate, tend to show that the Bushire trade cannot bear those calls which really large trade usually can sustain without ruinous effects.

† The landing of goods and the embarkation of goods at Bushire are a monopoly in the hands of a man called a Hamal Bashee. He farms this business, and no person other than he is allowed to land or embark goods.

It is true that it would be open to an English merchant to introduce his own cargo boats; but then he must also have his own boatmen, and these Persian subjects, otherwise they might be interfered with.

In my opinion, any steamer line in the Gulf trade should render itself wholly independent of the shore for the landing and embarkation of its goods.

Treaty in and out at 5 per cent. without further inland demand. But Native trade loses on the import as compared with ours, and perhaps in some articles gains on the export; *e. g.* on exportation of corn. Twice since I arrived in the Gulf, now four months ago, the export of corn has been interdicted, and an English barque, for which corn had been stored when no prohibition existed, and which for the lading of this corn had foregone a cargo of dates at Busreh, was obliged a few weeks past to purchase stone ballast at Bushire, and proceed in ballast to England, owing to the sudden local interdict on corn. In one instance the Governor relaxed the interdict out of friendly feeling towards me. I am sensible of the kindness. But trade cannot thrive under considerations of personality or arbitrary interference. A British merchant assured me that the prosperity of English trade at Bushire hinged much on the terms subsisting between the Resident and the Persian authorities. Again, a flight of locusts or absence of rain is sufficient cause for a sudden Corn Law. Douceurs, &c. are said to be almost essential to the conduct of trade at all. The Governments of countries are probably as good as the governed deserve. But it is none the less true, that among the principal difficulties in the development of the Persian Gulf trade, must be numbered that resulting from the action of Governmental authority. It is just however to add, that since the foregoing was written, the Shah has disapproved his Governor's interdict.

58. Some few years ago, 6 to 7 square-rigged vessels came from Mauritius annually in ballast and ran back corn. This trade has ceased, or turned towards Kurrachee, owing, as I am assured, to the vexations it suffered in the Gulf.

59. The Cotton trade at Bushire has, as elsewhere, received a considerable impetus by the American Civil War. 60,000 Tabreez maunds (7¾ lbs. each) have been shipped, and it is said that during the coming season ten times that quantity may be thrown on the market. Prices rose so high, that it would have paid to bring Cotton from Tabreez, some 12 or 13 hundred miles, on mules, and export it at Bushire. Persia can grow Cotton from Tabreez West to Meshed East, and South-ward to the Cotton fields of Reshire, four miles from Bushire. These latter returned good crops, until changes in taxation stopped the sowing, and the cultivators decreased in numbers.

60. The Sugar trade with Java has increased during the past 20 years from 5,000 Peculs (17 Tabreez maunds each) to 50,000 Peculs. This sugar drives those of Mysore, Bengal, Mauritius, and Siam out of the market. The refiners find that the Java sugar yields a larger quantity of loaf sugar per maund than the other sugars.

61. A considerable trade in Opium has sprung up of late years with Yezd, and I believe also Ghayn. Their light yellow-coloured stick Opium, when unadulterated, is of excellent quality. Accounts differ as to the place it now occupies in the market: one of the China journals asserting that excessive adulteration had destroyed its chance in that country. While here it is asserted, that large quantities still reach China *viâ* Batavia and Singapoor.

62. The export of wool to the quantity of 100,000 Tabreez maunds is I think inconsiderable as compared with what might take place. Some of the wool is imported at Bushire in the first instance from other and minor ports. But I surmise that, if a regular demand were made known round the Gulf, and payment duly secured, a great development might be given to this trade.

63. Saltpetre, brought in small quantities from Lar, does not pay. It would have a better chance perhaps if manufactured at Kishm or Ormuz, or some other point on the sea board.

64. As to the route from Bushire inland, it is rugged, stony mountainous to Shiraz; but less so along the plateau to Ispahan and Teheran: a mule load of 340 lbs. or so may cost about 5 Tomans or a little less in carriage from Bushire to Teheran.

Viâ the Dulikee Pass, Kazroon, and thence to the point where trade diverges—Shiraz.

65. Moving Southward from Bushire you pass along a series of small coast villages, or insignificant ports lying amid a skirting of date trees, and immediately below a precipitous range of barren mountains, which, seen from a vessel's deck, seem to rise sheer out of the water, untrodden by human foot. Among these villages, Congoon was at one time a busy little place, but the Dashtee tribe, whose sea frontage is near, wasted and ruined it.

Congoon, Asseeloo, Nabend, Nakheeloo, Cheroo, Khelat, Charrack, and Mogoo.

66. At length you come to Lingah, the port next in importance to Bushire, of the 2nd Class, as now considered. The general character of the commerce of these two ports is similar; that of Lingah, of course, being far less in extent and smaller in variety. Its recent condition has been unusually prosperous. But the history of its rise is instructive. Comparatively a few years ago it was almost unknown, and was farmed for 100 Tomans per annum under the local Government of Lar. The farm subsequently rose to 200 Tomans. Presently the Sheikh of Lingah chanced to have a quarrel with the Sheikh of Abbass. The latter exposed the lightness of the demand made by government against Lingah, as compared with that made elsewhere. The trade of Lingah was inquired into, and the annual contract raised to 2,000 Tomans. The increase of trade then slackened. It may at present have a trade equivalent to about one-fourth* that of Bushire. The principal attractions of the place are that goods can be dropped there more quietly than at Bushire, and with less interference and cost. They can then sometimes find their way through the dilapidated walls of Shiraz without a second demand; while a caravan coming from Bushire, is generally advertised to the authorities at Shiraz.

That is of ports ethnologically Arab, but considered under Class 2.

67. But Lingah, in point of position and lines of road to the interior, is less favourably situated perhaps than any other port. The route to Shiraz is arduous, ill-supplied, and unsafe. It is probable its commerce, as compared with that of other ports, would rather decrease than otherwise under a thorough development of the Gulf trade.

68. Apart however from its landward trade, Lingah enjoys a sea carrying trade. She imports timber from India, and may possess some twelve buglas of from 200 to 300 tons each; some 50 smaller craft of from 50 to 60 tons; and 500 or 600 small coasting buggarehs. But the number of boats belonging to a port in the Gulf is no sufficient criterion of the trade of that port. Bunder Abbass possesses scarcely any boats. Craft call there en route to the Northward or to India, drop and take in cargo, and pass on. The newly established line of steamers follow the same practice.

* I suspect its trade is more than one-fourth as large.

69. I pass Southward to the 3rd Class of territories; among these the principal port is Bunder Abbass. The trade of this port is variously estimated. All admit it to be thriving. I am inclined to suppose it may be three-fourths as large as that of Bushire, perhaps even more.

Bunder Abbass, with its adjacent districts Northward to a point near Lingah, and Southwards to a tract whose political jurisdiction is not determined under Treaty entered into and recognised by everybody concerned. Island of Kishm and dependencies.

70. The means for collecting any detailed account of the trade of Bunder Abbass are not at my disposal, this port being temporarily farmed by Muscat, and thus excluded the region of communication with this Residency. It is, however, the principal port of entry for piece goods into Persia. It imports also coffee, tea, sugar, spices, and miscellaneous goods. Among its exports are wool and fruit, the latter drawn from a fertile district a little inland.

71. I have noticed that Bunder Abbass has been somewhat decried as a port; but I am of opinion, that it is the point where trade coming to and fro a vast area of southern Central Asia, naturally meets the sea. At present its trade is said to be in a partially abnormal condition, owing to its following a route which, if Bushire were less interfered with, would not fall to Abbass. For instance, Bunder Abbass in some degree supplies the Shiraz market; and this, although the road thither is twice as long as from that town to Bushire, besides being less safe. In its normal condition, perhaps the proper sphere of Bunder Abbas trade would be along the Yezd and Kerman routes to points found along a line extending from Furrah, through Herat, Ghayn, Tong, Tubbus, Meshed Nishepoor, and so to Teheran. The Bunder Abbass trade should in brief be a central one, meeting the Kurrachee trade *viâ* Candahar on its Eastern flank, the Russian trade of the Oxus and Caspian on its North, and the Tabreez and Bushire trade on its Western side. No doubt a large area in the region thus described is at present comparatively desert; while those portions of it known politically, such for instance as the States of Herat, Khion, and Bokhara, are poor consumers. Still the total area to be supplied is so extensive, that even an infinitessimally small trade per 10 square miles would endow Bunder Abbass with a rich commerce. Moreover, some of the states referred to were once comparatively wealthy, and still contain the soil, the positions, and the men for becoming so again.

Political circumstances, and the slow permeation of thought through those regions, may any day give them "an impulse, as welcome in the commercial as it may prove startling in the political world. I chanced some little time ago to read the History of Genghis Khan with an Heratee, who formerly administered the Illyat districts of that principality. I asked him how it was no Genghis arose now to redeem his country? He replied, "We possess too many of them. In old times men were beasts of burthen. A Chief of character could do what he liked and they would follow. But people travel now, and think and look to money results. Caravans come from Hind and Russ and tell them what is what. Heratees would not follow a Genghis or Nader now ;* but if a Sahib were to go and lead them on in advance of what they now are, as Genghis did in advance of what they were in his time, and if he would pay them properly (for men will not work continuously now without pay), he might in three or four years render the country more flourishing than it was under the sons of Timour Lang."

72. To return: as illustrative of the manner in which trade meets, competes, and finds its level at points along the line towards which that of Bunder Abbass naturally flows, I may mention, that when I was at Herat in 1860-61, I found piece goods from the Teheran and Candahar lines, bearing their respective English and Russian marks, competing on the same counter in the Herat bazaar; and their respective qualities severely criticized by the traders. They seemed on the whole, to prefer the Teheran goods, but those from India were cheaper. True, it was surmised that the Teheran goods came originally in greatest part from England. Again, I found Russian brick tea meeting tea from all other quarters, and commanding the highest price as the best in the market. The retailers told me Kurrachee tea was driving a hard bargain with others to maintain their ground; but the retailers added, that some tea had arrived from Kurrachee during

* I remember coming on some two thousand families of the Jumsheedee Tribe of the Bala Moorghab. They had refused to fight for the Herat Sirdar; had been attacked by him; had been worsted and led into captivity. When I fell in with them they had just reached the bank of the Herat river. Some were urging on their cattle, some helping on their children. Many, particularly of the women, were seated in a most desponding manner on the river bank. The 137 Psalm was before you. "By the river, there we sat down, yea, we wept when we remembered * * * Oh, daughter of Babylon, who art to be destroyed! &c.

the preceding year, not in boxes like the Bombay tea, but in small packets, and that this latter was so execrable, as to have injured the general repute of Kurrachee borne teas. I was puzzled at the moment to distinguish the tea in question, but it was practically explained to me on subsequent arrival at Kurrachee, that tea was brought to Sind in packets for the use of troops and others; that this tea, after being drunk by the soldiers, was re-collected, dried, and repacked in the old packets by the barrack boys, and then sold in the Kurrachee bazar for a mere song, to be exported *viâ* the Candahar line. Again, I found some stick opium of excellent quality from Ghayn, and on showing it at Bombay, attention was drawn to the circumstance *viâ* the Gulf, and a considerable trade from the Ghayn direction has since sprung up. I was struck all along the route of North Persia with the unvarying presence of the Russian lumbersome tea-urn (Samawar) brought from the great fairs beyond the Caspian; would it not be possible to bring into competition with it a lighter handier article?

73. That Bunder Abbass is situate in a position favourable for trade, is in some degree to be inferred from the history of the neighbouring island of Ormuz. No island could possibly look more unpromising. It is, in brief, a confused looking mass of spongy earth mounds and saline efflorescence. Yet under European management, in times gone by, it was described as follows:—

Instamond, in his History of the East Indies says:—"At the mouth of the Strait of Mocandon, which leads into the Persian Gulf, lies the island of Gombroon. In the eleventh century an Arabian conqueror built upon this barren rock the city of Ormuz, which afterwards became the capital of an empire, comprehending a considerable portion of Arabia on one side and of Persia on the other. Ormuz had two good harbours, and was large and well fortified; its riches and strength were entirely owing to its situation. It was the centre of trade between Persia and the Indies, which was very considerable, if we remember that the Persians at that time caused the greatest part of the merchandise of Asia to be conveyed to Europe from the ports of Syria and Caffa. At the time of the arrival of the foreign merchants, Ormuz afforded a more splendid and agreeable scene than any city in the East. Persons from all parts of the globe exchanged their commodities and transacted their business with an air of politeness and attention which are seldom seen in other places of trade.

"These manners were introduced by the merchants belonging to the ports, who induced foreigners to imitate their affability. Their address, the regularity of their police, and the variety of entertainments which their city afforded, joined to the interests of commerce, invited merchants to make it a place of resort. The pavement of the streets was covered with mats, and in some places with carpets, and the linen awnings which were suspended from the tops of houses prevented any inconvenience from the heat of the sun. Indian cabinets, ornamented with gilded vases or China, filled with flowering shrubs or aromatic plants, adorned their apartments; camels laden with water were stationed in the public squares; Persian wines, perfumes, and all the delicacies of the table were furnished in the greatest abundance, and they had the music of the East in its highest perfection. In short, universal opulence and extensive commerce, a refined luxury, politeness in the men and gallantry in the women, united all their attractions to make this city the seat of pleasure.

An English traveller, Ralph Filch, who visited this island, describes it thus:—

"Ormuz is an island in circuit about five and twenty or thirty miles, and is the driest island in the world, for there is nothing growing on it, but only salt; for the water, wood, or victuals, and all things necessary, come out of Persia, which is about twelve miles from thence. All thereabout is very fruitful, from whence all kinds of victuals are sent into Ormuz. The Portuguese have a castle here which standeth near unto the sea, wherein there is a Captain for the king of Portugal, having under him a convenient number of soldiers, whereof some part remain in the castle and some in the town. In this town are merchants of all nations, and many Moors and Gentiles. There is a very great trade of all sorts of spices, drugs, silk, cloth of silk, fine tapestry of Persia, great store of pearls, which come from the isle of Bahrein, and are the best pearls of all others, and many horses of Persia, which serve all India."

74. That the island, instead of the present port, was at that time made the entrepôt, was due probably to the circumstance that a foreign settlement of merchants preferred to sustain the cost of a double landing and shipment, rather than run the risk to property and person incident to a residence on the main land.

75. When however Shah Abbas, a Sovereign whose Serais for the accommodation of trade are among the noblest and most enduring architectural structures in Persia, turned his keen commercial eye towards the Gulf, he put his finger on its entrance, preferred the mainland to the island, established a port, and gave it his own name. It is possible we may have put a finger down too.

76. As to the customs of Bunder Abbass, they are lumped in the farm with its inland revenues for 16,000 Tomans per annum; of which 10,000 may represent customs. The farm has some thirteen years yet to run, and the terms of the Treaty including it are hostile to the intrusion of foreigners, and afford Persia a considerable room for interference. The Sultan of Muscat in turn farms both the Muscat and Abbass Customs to a Bunya for 95,000 Tomans; of which, perhaps, 20,000 Tomans may represent Abbass dues; but, on the whole, the trade of the Muscat State is in a partially transition condition, owing to the division of the Imaumship into the two separate Sultanuts of Zanzibar and Muscat, under the arbitrement of the late Earl Canning. The web and woof of the home trade is of course for the moment rent asunder, and commerce takes time to re-adjust itself along new groves under altered circumstances.

77. The small town of Kishm, on the Southern end of the island of that name, is another port farmed from Persia by Muscat. Its principal export is salt, which it sends Eastwards. Its imports are mainly for consumption on the island. Perhaps a sulphur and saltpetre trade might succeed at Kishm.

78. The islet of Angaum, on the sea-side of Kishm, might be a convenient point for a coal depôt. The Sound is always calm on one side, with a channel of 6 or 7 fathoms; but it should be borne in mind, that this islet, like Kishm itself, may revert to Persia a few years hence, and that Persia is jealous of any footing whatsoever being gained on her territory by an European.

79. My suggestion is, that in developing the trade of the Persian Gulf, we keep as free as may be convenient of dependence upon foreign States. I believe we can do so whether we regard our trade, our telegraph, or our coal stations.

80. Before crossing to the other side of the Gulf, it may be well to turn a general glance over Persian trade, considered as a whole, and as it may be expected to develop.

81. The greatest consumers in Persia, area for area, are to be found within an obtuse angled triangle, of which a line drawn from Tabreez on the West, along the Southern shore of the Caspian to Meshed on the East, would form the base; and of which lines drawn from Meshed and Tabreez respectively to Ispahan, would form the other two sides. Now trade must reach these consumers along one or more of the following routes:—

1*st*.—*Viâ* Turkish Armenia from Trebizond to Tabreez.

2*nd*.—*Viâ* the Russian Caucasian Provinces from Poti to Tabreez.

3*rd*.—From the line of the Volga across the Caspian to Resht or Asterabad.

4*th*.—From Kurrachee *viâ* the Candahar line to Furrah, and thence either through Herat to Meshed, or through Ghayn to the Nishapoor portion of the Teheran road.

5*th*.—From Bunder Abbass through Yezd or Kerman.

6*th*.—From Bushire *viâ* Shiraz, and thence through Ispahan or Yezd.

7*th*.—From some port on the Persian Gulf other than Bushire and Bunder Abbass; or

8*th*.—Along some line between the head of the Gulf and Baghdad, and thence continuing either into the plateau of Persia *viâ* Kermanshah, Shuster, or else keeping Northward through the Kurds.

82. But trade coming by the first route has to meet the Turkish Custom Houses; to traverse 500 miles of mountainous country, sometimes impassable from snow, and oftener unsafe from plunderers, until it reach Tabreez. It has then to meet the Persian Customs, and if sent on to Teheran to make another land journey of 700 miles, or if to Ispahan of 800 or more. If finally it go on to Meshed, it has a further land route of 800 miles along a frontier road scant of water and supplies, and broken in upon by the Turcomans of the Attruk and Goorgan.

83. If trade come *viâ* Georgia, it has the Russian duties to pay; many difficulties of carriage from Poti to Khoi; then to meet the Persian Customs at Tabreez; and so on, as above detailed. If it debouche on the Caspian at Lenkaran, it has re-shipment, re-landing, and the tropical unroaded provinces of Ghelan or Mazanderan to traverse

before it ascends the Ghats to Casween, or debouches on the Meshed road at Bostan.

84. The Volga line, though enjoying lengthened water carriage, has also to bear a long land journey to meet Custom houses, repeated re-shipments, sometimes the cost of steam transit, and eventually to land at Resht or Asterabad, and proceed as above described.

85. If trade come from Kurrachee, it must pass up either Sind or Beloochistan to the Afghan frontier near Shawl, a distance of some 500 miles; a road singularly rocky and mountainous if by Beloochistan, and involving the Bolan Pass if by Sind. From Shawl it has a journey of 200 miles nearly to Candahar, and of 300 miles on to Furrah, subjected en route to Afghan interference and dues. At Furrah it must diverge either 200 miles to Herat,* or 400 or 500 miles to the Teheran road; and in either case to traverse a wild region, where the Borderers of Persia, Seistan, Afghanistan, and Herat meet on their conterminous frontiers. From Herat to Meshed, 200 miles, it must travel along a border tramped and desolated by the Saloor, Sarookh, and Tekkee Turcomans of the Moorghab and Merve. These plunderers have already carried into slavery the men, women, and children of hundreds of villages along this line, and those villages still lie waste and tenantless. From Meshed and the Neshapoor point the route is as before noticed.

86. For trade to proceed from any point on the Gulf other than Bushire or Bunder Abbass, would involve the opening up of a new line, along a route more arduous, less safe, and not shorter; and the same remark would apply to the Shuster line.

87. As to Baghdad, it seems at first glance to possess some advantages, in that trade could reach the trinagle sought by shortening its land and lengthening its water transit. But merchants object, that this route would involve sailing seagoing craft up to Busreh; of their running the gauntlet of the Turkish Custom Houses; of changing to river craft; breaking bulk; and of eventually having to cross an unsafe tract between Baghdad and Kermanshah; there meeting the Persian duties. Hence this line is not availed of, unless for the trade of the Shat-ool-Arab, Tigris, and Kermanshah and Hamadan lines of

* The direct road to the Fort of Herat leaves the Fort of Furrah to its left and passes by Geraneh.

consumption. But I am ill-acquainted with this line, although I find among my recollections a passing visit, that the walls of Baghdad appeared to have been built for a bigger city, and that there were few trading craft on the Tigris.

88. Similar remarks would apply with increased force to any route running North from Baghdad towards the Kurds.

89. If to the foregoing glance along these routes I might add a fact or two drawn from personal observation, I would remark, that I met comparatively little traffic between Trebezond and Tabreez; although Tabreez itself seemed a considerable commercial town, with well-cultivated environs. The road from Tabreez to Teheran was as unfrequented, until one arrived at Casween, the nearest town of any importance to the capital. Between Teheran and Meshed I met very few caravans, and they were principally engaged in carrying dead bodies or pilgrims from Bokhara and Meshed to Kurbella, Nejd, and Mecca; or in carrying pilgrims Eastwards to the shrine at Meshed. From Meshed to Herat and from Herat through Furrah to Ghiriska on the Helmund I did not meet a single Kafla; although I came on the track of one, which was utterly destroyed next morning near Laush Jowain, and although I met at the Kohi Doozdan on the Kash Road the Seistanees, who had a night or two before smitten the only Kafla they had been able to fall in with.

90. Between Candahar, Quetta, Khelat, and the head of the Bolan, I met now and then a string of camels; * but I found between Khozdar and Kurrachee a larger bulk of goods on camels than I had met along the entire route from Meshed to Khozdar; I might perhaps add from even Teheran to Khozdar. I fling these facts out, without wishing to strain them into a theory for determining the proportions of trade along any given distance. And it is possible, had I returned to Teheran, the facts might have been different.

91. I think, however, all circumstances considered, that trade, if left free, or even if only moderately harrassed, should be able, when landed at Bunder Abbass, to command the markets of Kerman and Yezd—the latter one of the wealthiest and most enterprising towns in

* I went half way down the Moolla Pass, but I did not meet any traffic there. It was in December.

Persia*—that it should further be able to compete with trade coming along any of the lines above enumerated to Ispahan, Teheran, and Meshed; and then that it should flow along the Tabreez line until overpowered by the countercurrents of the Russian and Turkish Armenian lines. Bunder Abbass would naturally absorb also any little trade that might be needed for Western Mekran.

92. I think secondly that trade, without smuggling at Lingah, should command the immediate neighbourhood of Lar, and the adjacent coast line.

93. Thirdly, that trade landed at Bushire should command those districts below the passes, and also the market of Shiraz and the province of Fars in general. It might compete with other routes as far North as Ispahan, but not I think at Teheran. Finally, it might be able to throw a sprinkling of goods towards Yezd.

94. The advantages of Bunder Abbass as a port for the supply of the markets under notice, may be compared with those of Bushire as follows:—

95. Bunder Abbass is less interfered with by authority. The dues are more moderate, and are levied without needless delay or injury to goods, absence of octroi, no subsequent governmental demand, unless at Yezd, where it is moderate, readily levied, and whence trade moves on direct to the capital; (while trade at Bushire sustains en route not only octroi, but a heavy demand and delay at Shiraz, and a third demand at Ispahan;) an easier and more level road; an abundant supply of camels instead of a limited supply of mules—each camel carrying 450 lbs. against a mule's 340 lbs. and costing one-third less; avoidance of delay and risk incident to sea passage of the Gulf against the prevailing Nor-Westers.

96. The disadvantages of Bunder Abbass are—

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* The principal merchants at Yezd are Guebres, also some Hindoos, and a few Ispahanees. The Hindoos are from Mooltan. It is remarkable, that on the Herat and Bokhara line the Indian traders come from Shikarpoor principally. Then towards South Persia from Mooltan. At Zanzibar they are principally from Kutch and that neighbourhood. At Bushire there is not a single Banyan. The fact is, a Banyan will stand any tyranny, any misery, anything you please, except *permanent* loss of profits; when this last calamity arrives, he goes away, as he has done from Bushire.

1*st*.—That its town and road are considered less safe; but this objection is mitigated by the largeness of caravans. An Abbass Kafla may number from 1,000 to 2,000 camels. In Bushire it is rare to see 100 mules in the same Kafla.

2*nd*.—That the distance from Bunder Abbass to Teheran *viâ* Yezd is longer than that of Bushire from Teheran *viâ* Ispahan and Shiraz; but then the Yezd road, as before mentioned, is easier and less interfered with, hence less delayed.

97. Looking forward to the possible development of Persian and Central Asiatic trade from the Gulf line, I should say that, compared with its area, it must always be small; but that the area, for the supply of which the Persian Gulf is the only continuous ocean line, is so immense, that the trade, naturally seeking its waters would, if not stifled by authority, rapidly increase, and be very considerable, regarded as a whole. The Persian peasant is a frugal, avaricious, trade-seeking man. The climate over the entire area to be served necessitates clothing. I have never met a man without a hat or turban of some sort. The Persian Khula is an article of fashion, and may cost anything from 10 shillings to £10. The Illyat wears a felt; the Persianized Arab a holy turban. Everybody carries a pair of shoes or sandals on his feet or in his hands. Trowsers obtain in towns, but are wisely discarded in country, as an impediment to free walking. As to coats they are universal, of the length of the body, and of all colours and descriptions. The Persian usually carries all he possesses on his back; looks cool during his visit; and unpeels seven, eight, or a dozen outer garments when he gets home. In China-ware he is a connoisseur, and it is difficult to deceive him. Arms of all sorts are in request; but a double-barrelled over and under pistol is wisely preferred to a revolver. It is remarkable how long the awkward match or flint-lock holds its ground; and I cannot but think that it is in some degree due to the want of a thorough trial of our modern rifles. They appreciate our fowling-pieces. All this means trade.

98. But the fact is, that in Central Asia, as elsewhere, if you want to trade, especially in the retail or fancy line, you must study fashion. If you throw red broad-cloth into a Persian town, or stone-colour, black, or sky-colour among the Bedouins, they may remain on hand.

Exchange the bales across the Gulf, and they may sell off-hand. When I was at Zanzibar last year, an enterprising Hanseatic merchant hit upon the idea of imitating the famous Muscat turban. He found he could import from Hambro an equally good looking (in my view better) article at a reduced price: but the Arabs and Sowahaille men about town decided the colours were a little too bright: the article was forthwith gossamer to a beaver. Another gentleman sampled a large pink bead. The only objection possible to it was, that it did not sell in Uniamesi, among the Mountains of the Moon. Similar accidents happened in piece goods: a stripe too broad or a line too little was sufficient to make the conversative ladies of the Negro races doubt quality, and stick to the original Surat, Broach, or Bengal.

99. In the articles of ghee, cotton, madder-root, opium, and wool, there is room for indefinite extension. It might be possible to create a trade in horns, glue, hides, saltpetre, and sulphur. Persia possesses great mineral wealth and coals, and sooner or later these must come to market. The coal we used at the Teheran Legation was fetched some 10 or 12 miles from near Damawend. It was of good quality, and I am of opinion that similar coal is findable in the hills near Bushire at Gesakoon and Halila Hill.

100. But it is rash to foretell the future of trade, or to prefer one route to another, so long as the arbitrary interferences of authority may by a stroke of the pen ruin one line or force another.

101. I cross the Gulf to Mussendom. It is on this deeply indented and fantastically outlined cape that the territory directly under the Sultan of Muscat lies. A singular race of men inhabit the headland, and seem to be an early race, driven by stronger growths of humanity into this remotest corner. They appear as though they had paused here only because precipiced over the sea.

Class No. 4.

102. As to the ports of this territory, they are of no present commercial value. But, as submitted more in detail in my letters now noted, I am of opinion, that the neighbourhood of Khussub, at the outer entrance of the Elphinstone Inlet, is a convenient point for the immediate establishment of an

Koomzar Khussub.

No. 1 A, dated 13th January 1863.
No. 2 A, dated 2nd February 1863.
No. 6 A, dated 16th ditto.

English free port, under a clear, written, permanent, unquestionable title to be obtained from our ancient Ally of Muscat: concentrating there our Coal and Telegraph main stations for the Gulf, together with our Political Residency. Politically and strategically considered, this point might be rendered the key of the Persian Gulf. As a Coal Depôt it affords calm and good anchorage, and would save colliers the risk, time, and cost of working up and down the Gulf. As a Telegraph station it is on the Elphinstone Creek, whose head touches the neck of the promontory at its narrowest part: and after a land passage of some 400 yards, meets the head of a deep water inlet opening on the Eastern side of the cape. A trading steamer taking in coal at Khussub, could run to Busreh or Koweit and back without filling up. The entrance of the Gulf is the natural terminus for your square-rigged vessels, and trade should be delivered round the Gulf and up the Busreh river or Koweit creeks in suitable native Gulf craft or steamers. A large bugla can run cheaper than a square-rig, ton for ton, under particular circumstances. For instance between Bombay and East Africa they run down with the North-east and return with the first breezes of the South-west monsoons. But the argument fails to apply when the length of voyage and the variability of winds, and the intervening of heavy weather, impede, endanger, or stop pattimar sailing.

103. The case of Ormuz is a precedent for a like station. The interferences, incertitude, and want of accurate knowledge of the market all round the Gulf, point to the alleviation of these evils, by the creation of a general entrepôt at a convenient point, where all vessels passing near the Gulf outside would, if they pleased to call, find cargo ready; whereto all boats finding a favourable chance for exports from their several jurisdictions could run a cargo in a few days; and whereto all trade might converge, as circumstances admitted, from ports subjected to sudden but not permanent arbitrary interference.

104. My respectful suggestion to Government is, that the formation of a port so concentrating all our interests, would do more to create and to develop the trade of the Gulf and Busreh line, and would do more to keep the Government accurately informed as to their relations, and the condition of commerce in the Gulf, and would further do more to keep the Maritime Arabs quiet, and to afford an issue for whatever capabilities of trade may be possessed

by Arabia, than could all the reports, all the figured statements, and all the amicable interviews of all the Residents and all the Native authorities that ever had or may have place round these waters.

105. But the port must be really free, and all tribes and people must know and feel it to be free; and that once there, their goods and persons are secure and unmolested. Let the authorities of the port limit their functions to keeping the peace, removing obstacles, enforcing valid contracts, and punishing mercantile crime. For the rest leave all to private enterprise, and leave trade free as the tide to flow in and out. I think that thus only can we practically test the commercial capabilities of the Gulf: perhaps in no other manner can trade attain its full and undeformed growth all round the globe.

106. The next class of territory to be noticed, is that of the independent Maritime Arabs. These tribes yield a tithe to the Ruler of Nejd, whose capital, centred at Rias, near Daryah, has an advanced Fort Beymer astride the North-eastern portion of Arabia, midway between Ras-ul-khyma and the towns of Muscat. And as the Ameer of Nejd is himself a tributary of Turkey, it follows that all the Arab Maritime Chiefs are quasi sub-feudatories of the Sultan, although they do not acknowledge his suzerainty, unless, as on one or two occasions has been the case with Bahrein, it suits their convenience. Bahrein once hoisted in succession Turkish, Persian, and English flags. It is even added she has been known to hoist all three at once.

107. These Maritime tribes are located along the West coast of the Gulf, from Ras-ul-khymah to Bahrein, both inclusive. They may be distinguished into Chiefdoms headed along the so-called Pirate Coast, and separated by a long reach of barren shore and desert, from the most Northerly Sheikhdom of the island of Bahrein, with its subject district of Guttur on the main.

Ras-ul-khyma.
Shargah.
Amulgavine.
Ejmaun.
Debaye.
Aboothabee, properly Boozabee.

108. It is unnecessary to trace the intricate and lengthened genealogies of these tribes: suffice it to note that as at present found they are named as per margin.

Joasmees.
Beni Yas.
Uttoobees.

109. Their settlements are mainly dependant for subsistence upon the proceeds of their pearl divings. They possess little territory, and perhaps even less real authority beyond their own immediate suburbs and date groves; the latter too are scant. As to the Pearl banks these are held in common by the tribes, and thousands of boats collect there during the diving season, from April to September. The revenues of these banks are somewhat as below.* An English vessel of war usually cruizes on the banks during the Diving season to keep the peace; but I have in a former letter† reported more in detail on these banks and their present circumstances.

110. The Maritime Arabs trade also with Zanzibar and the Malabar Coast; Mangalore being their favourite port I hear on the latter. They export dried fish, and import from Malabar rice and some teakwood, and from Africa masts for their boats (for which a capital kind of wood of great strength and pliability is found up the Pangany river, on the hill-land of Tangaty, and I believe further Northward, in Usumbarah), cloves, of which Zanzibar grows enough for the world's consumption, and rice, which was expelled the island of Zanzibar (to the great improvement of its salubrity) to make room for cloves; but which is still grown of good quality on the opposite African mainland. It is worthy of remark however, that although rice may be grown to a practically unlimited extent on portions of the Gulf districts, yet that the Indian rice is imported and is preferred to all others: the explanation seems to be, that Indian rice is lighter and swells more in the boiling; hence it is more filling at the price, and takes longer to digest: a sufficiently nutritive substance being granted, the essentials of a poor man's food are, the greatest possible bulk at a minimum cost. Cocoanuts are also brought to some extent from Zanzibar and Pembeh; but the market for these—and there is a rapidly increasing one—is towards Marseilles and Hambro. It is possible, indeed, that cocoanuts may soon replace the clove plantations. At present the fruit leaves Zanzibar in pulp dried. It is obvious however, that if circumstances

* Sheikh of Bahrein.
Sheikh of Ras-ul-khyma.
Sheikh of Debaye.
Sheikh of Amulgavine.
Sheikh of Aboothabee.
Sheikh of Ejmaun.

The gross yieldings are given in margin of paragraph 115. They may be for Bahrein itself 350,000 Dollars, and for the other ports 400,000 Dollars.

† No. 39, Political Department, of 2nd February 1863.

should favour the expression of the oil on the spot, a larger quantity of oil might be thrown into the European markets from a reduced tonnage. It is surmised that a salad and olive oil of good repute is refined from the Zanzibar cocoanuts. When in Africa, I suspected the salt-fish trade with Arabia to be a ruse for running a return cargo of slaves; it is possible some of Her Majesty's Naval Officers still think so. The salt-fish trade is however a *bonâ fide* one; and not only so, but it is, pearls alone excepted, the sole export of these Maritime Arabs. Men must export what they can produce and spare, or else they must go without imports. If men, situate like these Arabs, do not export salt-fish and pearls, they must either turn pirates or starve.

111. So long ago as 1823, Captain McLeod, reporting on the Joasmee tribe (being then at Ras-ul-khyma and Shargah), described them as possessing "no articles of export, since their pearls are generally purchased by merchants on the spot, and the produce of their country is not even sufficient for their maintenance. Their only employment is fishing, diving for pearls, and importing dates, grain, and other necessaries of life, which they purchase with the price of those pearls. Their dates are chiefly brought from Bahrein and Busreh; grain and cloth from Muscat and the Persian ports. They are very poor, and perhaps can never find much employment in commerce, unless in carrying for others, although it is said they at one time possessed a very extensive trade. The Joasmees procure all their materials for building, as well as their warlike stores from Muscat, Bahrein, and the Persian Ports in the lower part of the Gulf."

112. Colonel Kemball, writing in 1845, remarked:—

"Upon the success of the Pearl fishing, and the profits of the carrying trade which it brings into operation, must depend the means of obtaining the positive necessaries of life, and those trifling luxuries desirable to an Arab. It is needless to observe how materially their own condition, and by an easily deduced corollary, the safety of the Gulf might be affected by the failure of a single season." Hence "the anxiety and care, attended with great expense, which has been devoted" by our Government "to the maintenance of perfect tranquillity and security on the Pearl banks."

113. The Maritime resources of the Arab (or Piratical) ports are stated to be as follows:—

PORTS.	Buglas engaged in the Indian and African trades.	Their tonnage in Morahs.	Smaller vessels for Gulf trade from 500 to 1,000 Morahs.	Pearl Boats.	Remarks.
Ras-ul-khyma	11	24,000	15	15	
Ramse	1	1,000	5	....	Pays 800 Drs. annually to Ras-ul-khyma.
Jazirat-ul-Hamra..	....	....	6	35	Do. 900 to 1,000 do. do.
Himreeah	....	....	....	30	Do. 200 do. do.
Shargah	6	14,750	25	400	Do. 1,500 do. do.
Heyrah	....	....	....	25	Do. 50 to 75 do. to Shargah.
Fasht	....	....	....	25	Do. 100 do. do.
Khan	1	2,000	5	50	Do. 100 do. do.
Total....	19	41,750	56	580	In addition to the places here enumerated as Joasmee territory, Sheikh Sultan ben Suggur possesses several small places on this as well as Coomza, Dibah, and Khore Facawn, and others on the other side of Cape Mussendom, which yields him a small revenue. His supremacy over Cassaab is merely nominal.
Amulgavine	3	9,500	10	60	
Ejman	4	6,000	10	50	
Debaye.....	....	....	4	90	
Aboothabee	2	4,000	10	600	

The tax levied upon each diver and his attendant varies under the different Arab Chieftains from 1½ to 7 Dollars. The amount too fluctuates each season at the will of the Sheikh.

114. The population varies in these towns, and the frequent convulsions sustained by society have precluded any permanent increase. The ports of Aboothabee, Shargah, and Ras-ul-khyma may contain 3,000 households. Those of Amulgavine, Ejman, Debaye 1,200 or so; the lesser settlements at Khan, Heyrah, Fasht 600. I append, for more detailed information as to resources, a statement of the number of inhabitants, vessels, houses, and date trees of the Joasmees.

115. But the richest of the Maritime Arab states is Bahrein; which island is in part fertile and well watered. It is also singularly picturesque for this unfinished part of the world. The Sheikhs of Bahrein enjoy a revenue of some two lacs of rupees, levied on the land, or on boats engaged in the Pearl fishery, whither this state may send some 1,200 boats annually. The gross trade may be 28 lacs of rupees, dependant principally on pearls. No Custom

Exports.

Pearls, dried dates, bullion, of which some 8 lacs Rs. worth of pearls may first reach Bahrein from the other ports.

Imports.

Principally from India—rice, cotton, cloths, calicoes, and spices, of which ¼ may be con-

sumed in Bahrein, and ¾ re-exported.
16 Lacs Rupees.
12 Lacs Rupees.
28 Lacs Rupees.

dues are levied, but society has suffered many convulsions to the retardment and even falling off of population. The principal exports are pearls, dried fruits, and dates. About 350,000 Crowns worth of pearls are annually collected by craft belonging to Bahrein; and something more than this quantity is brought from other parts of the Gulf for sale. The imports are mainly from India: rice, cotton, piece goods, and spices. Of these, one-fourth may be consumed in Bahrein, and the remainder be re-exported to other ports in the Gulf.

116. The Chief of Bahrein possesses a greater number of craft than any other Arab Sheikh round the Gulf. His Marine has been quoted as below.* It is asserted that the trade of this island was greater 30 years ago than it now is.

117. Forty miles to the Northward of Bahrein commence the ports of the 5th Class, namely, those acknowledging suzerainty of Turkey, but practically independent. Kateef, the first of these, is the port of the Wahabee ruler, or more strictly of the Nejd Arabs, whose chief town of Rais, near Durayah, lies 11 days march Westward in the interior of Arabia. The present ruler of Nejd is the Ameer Fysul, highly reputed for his stern, effective, and just authority. Kateef however is considered unhealthy, and is not frequented by the Arabs coming down for exchange towards the coast. These stop at Lahsa, distant some ten fursacs from Kateef, and rather inland. Lahsa itself is healthy, and produces a large quantity of dates, stated to be equal in quality with those of Busreh. Few dates however find their way to the sea; unless for a small portion sent to Bahrein, which is distant from Ojair, the old but now abandoned port of Lahsa, only 14 miles.

118. It is this Nejd power, occupying the wide centre of Adnan Arabia, and composed of Nomadic or only partially stationary Arab tribes, some now in revolt, and some now used for quelling revolt, that threatens or dominates all round the shore line from the back of the

* 12 Buglas not trading.
25 Buglas of large size trading with India.
12 Batteels ditto ditto.
1,000 or 1,200 Boats Pearl fishing.
This statement relates to the Sheikh, not the whole of Bahrein.

Euphrates and Shat-ul-Arab down along the pirate coast above described, and thence round Cape Mussendom along Muscat, Oman, to Ras-ul-Had, on the Aden line.

119. It was a Cazee or Mollah of Busreh, named Wahab, who (or whose son), permeating these tribes with the metamorphic agency of a religious idea, fused them into an aggressive mass, which cropping out along the shore lines of Muscat and the Western coast of the Persian Gulf, compelled all these subdued tribes into plunder and piracy. Hence the once notorious appearance of the Maritime Arabs as pirates; hence our expeditions to the West coast of the Gulf; and hence the Ras-ul-khymas and Beni-Boo-Alis blending with our colours. An Arab Sheikh endeavoured to explain to me the nature of this unenduring Wahabee power, by likening it to the agency of Lord Clive, in conquering India with a sepoy army. The leading tenets of Wahab's faith seem to have been those common to Prophets, to proclaim himself and the Unity of the Creator, and kill or plunder his immortal creatures.

120. I confess that during my recent journey to Koweit, I was much impressed by the Arab character: I found in it an applombe, sound sense, thoughtfulness, and ready energy which contrasted favourably with at least one other Oriental people. It is worthy of notice, that whatever the Arabs possess, seem to be the best of their kind; their horses, dogs, poultry; their mules and donkeys; their dates; their coffee; their pearls; their spices and their frankincense.

121. They have been called for centuries vindictive, cruel. It is remarkable, however, that in no country in the world is the brute creation so much the friend of man; in no country is there that mutual confidence between man and beast; nowhere else that I have passed does the horse, and even the greyhound, seem so thoroughly to comprehend language addressed to them by man.

122. I crossed the desert when it was in blossom in the spring. The plain had recently been trampled by the feet of Bedouin camps, where every man's hand is against his neighbour. Yet even the birds seemed to welcome me. The lark, rising trustfully just in front of my bridle, startled the solemn silence of the desert with its happy song, and again breasting earth, all was still. Anon, a little lady of the Finch tribe would trip along beside me, evidently quite glad of a chance for prettily chirping the news: pity I could not make out what she said.

123. Meeting these Arabs, you readily comprehend how they once stormed across the world; and you leave them, persuaded that they still possess qualities which may again render them renowned, should outward circumstances favour. I could well understand how the tragic pastoral of Job was written by an Arab. The originals of the Patriarchs were before you: their life, their manners, and the results of these. I thought to myself, these Pentateuch people carry out the principle of simplicity in its integrity; yet I felt, also, that our present civilizations, may have to return in part to natural sources, before humanity can progress towards perfection.

124. I left the Arabs, impressed that their vices and their virtues, their customs, their manners, and their government, have been in a great degree formed by physical and accidental circumstances. A man who finds himself doomed to live in the Bedouin desert, cannot render his life similar to that of a man born of the same original stock, who finds himself among the natural bounties of Arabia Felix. Perhaps the names of Adnan and Khaitan, of the earliest recorded times, were only impersonations of the tribes who wandered for pasturage in the open, and of the tribes who had settled down to agriculture on some favoured spot. Both would naturally trace their origin to some one head, and this head would receive a name, as well as Adam. On the whole, the Arabs, like most other people I have met, seem to cut their coat very much according to their cloth. *Ubi homines sunt, modi sun;* and as soil is, so the mind of man.

125. I beg pardon for this seeming digression; but it is I think of importance, from a commercial point of view, to bear the character and country of these Arabs in mind. A tract whose people can suddenly appear in force on the lines of the Red Sea, Persian Gulf, and Euphrates, must be sufficiently numerous, and possess qualities to affect markets along those lines for good or for ill. A country that possesses so many articles of commerce, unequalled in their kind, may create an increased demand and supply in the general markets under European management. The Arabian, and perhaps other portions of the Gulf coast line, may be capable of supplying at a profit hides, horns, glue, saltpetre, wool.*

* I observed both on the East Coast Africa, at Magadosha and Brava, and also to some extent at Kurrachee, that when the trade came to be opened up by English or

Vide appended Statements of Exports and Imports to and from Kateef, Lahsa, and Bushire.

Total trade of Kateef may be annually 50,000 Dollars.

126. The least erroneous notion I can convey of the exterior trade of Kateef, and of the Nejd coast line in general, is as per margin.

127. The next port falling under the class of those recognising Turkish suzerainty, but pratically independent, is Koweit; and the history of this settlement is, in my opinion, so illustrative of what may be done in the Gulf by common sense applied to the creation of trade, that I shall venture to occupy a moment of the Government time with a brief summary of its history, as jotted down in my Diary, during my recent journey, from the lips of the present Chief and other Sheikhs of Koweit.

128. The family of the present Sheikh have ruled at Koweit some five generations, or about 250 years; for as these men live to the good old age of 120 years, their generations are, of course, nearly double ours; or about 50 years each. Originally, the Sheikh's progenitors dwelt in a small fort called Moomgussur, situate at the head of the Kore Abdullah, near Bunder Zobier. They were the pirates of the North of the Persian Gulf and lower channels of the Shat-ul-Arab. But about 250 years ago the Busreh authorities attacked and expelled them. The original Sheikh then came down the Boobian Creek with his followers, and debouched on the bay, at present known as that of Koweit or Grane. Crossing the bay, he settled on its Southern shore; and there erected a Fort or Kote: hence the name Kote or Koweit. The term Grane is rather applied to the shore line of the entire bay, from its resemblance to the curve formed by two horns—Keor or Ghern, meaning horn. The settlement was subsequently increased by the son of the founder, who erected the longer portion of the present walls; which, however, have since been again extended along the shore line, as the increase of population from time to time demanded.

129. Perhaps no conjuncture of circumstances could have seemed less favourable to the creation of a thriving commercial settlement, than the arrival of a band of Arab pirates on a barren shore, with brackish

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Continental merchants, these articles, especially hides, horns, and wool, were rendered valuable, and demand rapidly increased.

The same remark applies to Sessamum seed at Lamoo.

water, and back grounded by a series of Bedouins. Yet what is the fact? Here is a clean, active town, with a broad and open main bazaar, and numerous solid stone dwelling houses stretching along this strand, and containing some 20,000 inhabitants, attracting Arab and Persian merchants from all quarters by the equity of its rule and by the freedom of its trade. It imports from Malabar and Bombay some two lacs of rupees value, principally in longcloths, rice, coffee, planks, and spices. It exports some 800 horses at an average value of 300 rupees each; 40,000 rupees worth in wool; 60,000 rupees of dates; and perhaps 40,000 rupees worth in miscellanies, or say approximately nearly four lacs of rupees worth of exports against two and a half lacs imports. Of the horses, some 600 are shipped direct from Koweit, the remaining 200 from Busreh. The horse dealers of Koweit have their agents among the Shemma Anizee and other Nejd and miscellaneous tribes; collecting accurate detailed information as to all the pedigrees of horses, and as to all the foals coming on. These Agents, towards the commencement of the Bombay season, in July and August, bring down their purchased horses overland to Koweit; preferring this tedious route, with its cost of protection by the way, to running the gauntlet of the River Custom Houses, bad climate of Busreh, and other inconveniences.

130. The sailors of Koweit are highly reputed, and there may be some 4,000 of them afloat; but Koweit sends to Muskat for boat builders, as they are esteemed superior workmen. Among a long row of native craft of all sizes, I observed two small boats made at Cochin.

131. Koweit* sends about 30 boats annually to Bombay, each boat on an average of 100 tons, containing 2,000 baskets of dates, worth say 1,000 French rials. Hence the date export of 30,000 rials or 60,000 rupees. The dates are received or shipped from the Shat-ul-Arab. Horse forage comes in part down the Boobian Creek from Bunder Zobeir. Mutton, which is good, and milk, butter, &c. they receive from the Bedouins, who flock to the town, and are pitched in tents or huts all along the outside of its walls. These Bedouins are

* I found English saddles much esteemed among the Arabs at Koweit, and it occurred to me, that if among the presents made by Government in this part of the world to the Native Chiefs, useful articles like a saddle were included, not only would the receivers benefit by them, but some want might be created, whose supply would involve subsequent trade.

not allowed to enter the town armed; but they sell at the gate, where the Chief daily sits and looks on. Koweit may boast of some 6,000 fighting men within its walls; but the policy has been to keep the peace internally and with all its neighbours. It pays no tribute to the Ameer Fysul, but maintains friendly relations with him. It receives no tribute, customs, or revenue from any one; save small offerings at the gate, or from merchants, amounting perhaps to 20,000 rials per annum, and a complimentary present of dates from Busreh in token of Suzerainty, and for the supposed protection of the mouths of the Busreh river. The Government is patriarchal; the Sheikh managing the political, and the Cazee the judicial departments. The Sheikh himself would submit to the Cazee's decision. Punishment is rarely inflicted. Indeed, there seems little government interference anywhere, and little need for any. When my father was nearly 120 years old, remarked the Sheikh to me, he called me and said "I shall soon die. I have made no fortune, and can leave you no money; but I have made many and true friends, grapple them. While other states round the Gulf have fallen off from injustice or ill-government, mine has gone on increasing. Hold to my policy, and though you are surrounded by a desert, and pressed on by a once hostile and still wandering set of tribes, you will flourish." It is thus under the fostering care of a succession of common-sense rulers, and by means of a policy wisely originated and systematically pursued, that an Arab band of pirates appear as the masters of a thriving port, the refuge of the oppressed, and the peaceful free home of all. I confess that I looked round with something like amazement at finding such a political and commercial structure in such a region, and the work of such hands.

132. If Arabs can do all this in the remotest corner of the Persian Gulf, what might not we do if we held its key, gained the confidence of our neighbours by justice, and forwarded their material interests by the exercise of those moral qualities and that intellectual superiority which the civilization of our country bestows on every English gentleman of common capacity, over an Asiatic?

133. No doubt much of the prosperity of Koweit may be due to position and to a comparatively healthy climate. It was in ancient days the point where the sea trade took to caravans or river carriage. It still maintains its natural advantages, and although I would not recommend the artificial forcing of trade from its present course, I would

still keep an eye on Koweit for future purposes. It is, in my opinion, by no means impossible that Koweit, under an effective development of the Gulf trade, would become the terminus for our sea-going steamers, a coal station, and a telegraph station. The more you analyze the question, the more you will probably be struck by the fact that the trade of the East and West has a marked tendency to resume its old lines under improved means of transit. Koweit appears to me a preferable port to Busreh, for the same reasons that Kurrachee is preferable to Tatta. The climate of Busreh is fatal, that of Koweit comparatively good. The water of Koweit it is true is brackish, yet fever is unknown. Dysentery and ophthalmia are rare, and when men commence begetting new families at 80, and die at 120, the climate cannot be considered as prematurely exhausting.

134. The only remedies in use are firing, accompanied by doses of senna. If a man suffer from indigestion, he is fired in spots round the navel. If he have chest complaint, he is fired on the back near the shoulder blade. The sores are kept open for months as issues. And the efficacy of the treatment is much applauded. Their constitutions are strong however.

135. The prevalent North-wester is tempered from the desert by blowing over ten miles of bay; yet it does not, in that space, gain that muggy, relaxing character with which it arrives on the opposite coast at Bushire. Koweit is always approachable by ships, and affords good and ample harbourage. Busreh is 70 miles up a river. Koweit has a fine broad channel of creek water running from its bay up to within 12 miles of the Busreh point of the river. I landed close alongside the Zobeir Bunder, in 4 fathoms; and this was the least water I found in a mid-channel of an average width of one mile, from the Koweit end of the creek up to its head, within sight of the date trees on the Shat-ul-Arab near Busreh. The cutting of a canal across these twelve miles of flat soil would be a work of little cost and labour.

136. On the whole, and without endeavouring to change trade from any present channel, I would bear Koweit in mind as a convenient point for a telegraph station and for a coal depôt; for the meeting of sea-going and river steamers and other craft, and as a possible future port of importance.

137. I was a little surprised to find the Sheikh at Koweit well informed as to distant politics. They took in an Oriental Paris Gazette. They admired the generosity of our policy towards Turkey, but wondered we did not do as much for Christian Greece. They thought 90 millions sterling a heavy fee for the temporary restoration of an invalid friend. One white-beard said, that with states as with individuals, when their hour strikes it is of no use for men to alter the clock. To bind a crumbling government was like darning a Bedouin's coat. Too worn out to be mended, too rotten to be even washed, it would fall to pieces in spite of you. They considered our efforts against the slave trade more humane than successful; and they thought we might spend the money to better purpose on our own poor, with whose condition they were unfavourably impressed, as summarized in the "*Paris Gazette.*"*

138. The chief Sheikh was a remarkable man in all respects as he sat in the gate, his eyes undimmed by 80 years, and his patriarchal hands grasping a plated watch of the description commonly known as warming pan. (I am now sending him a gold watch and chain.) He never wears shoes; and his feet seem to have been the original of the Hercules at Florence. He has a voice like a trumpet; stopping every now and again with a loud hah, something between that of the Patriarch of the flock, and the sudden blast and pause in a favourite polka. His speech recalls the large utterance of the early gods. He told me that among the heirlooms of his family was an injunction, still daily religiously observed, to relieve the stranger: a large dinner, in an allotted hall, is prepared every evening for all wanderers and strangers who may wish to share it. The sole restriction is, that arms must be left at the gate. Practices like this may perhaps account for much of the peace, good will, and neighbourhood, and mercantile prosperity of this town. Charity; attraction of sorrow; relief of actual want; these are sentiments little thought of. Yet they are perhaps beyond all else, unless justice, the keys of personal power throughout the East.

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* One green young Sheikh asked me why we took so much trouble to protect Dhows from piracy; while we ourselves took more Dhows than any other tribe. At this, another Sheikh asked if it were true that I was inquiring into the facts of our recent seizures? The old Chief sat silent, looking in at his nose with crunched features like the rings round the gnarl of an Olive stump. All evidently awaited an explanation, which I did not accord.

139. The Sheikh said that his family had always been tributary to Turkey. But I learned from another source, that during some years they had hoisted their own flag. They found, however, that the Customs levied on their exports to Bombay, were more inconvenient when levied against an unrecognized flag than when levied against a Turkish craft. Koweit, shrinking from this foreign pressure, turned to her Sultan, and suddenly changed colour. Truly trade is sensitive as woman's modesty.

140. Be the Suzerainty of the Sublime Porte however of old or recent date, it is merely nominal; the Arabs acknowledge the Turks as we do the 39 Articles, which all accept and none remember.

141. The territory directly under Turkey is that of Busreh. It does not fall within my charge, nor on the Gulf shore, unless at one point not worthy of analysis, Faon.* One is struck by the extent of the ruins at Ashureeah, out in the desert, near Zobeir; but on examining the country, it is found that this site was well chosen as being the last healthy spot, not flooded, and a point the nearest practicable at once to the Zobeir bunder; to the land still covered with a network of hundreds of Bunds lying between the Zobier Creek and the Busreh River, and to the line of the Shat-ul-Arab itself.

Class No. 7.

142. As to Busreh itself, whose revenues may be as per margin, it looked to me, when seen from a house top, like a blending of Roree and Nuggur Tatta in Sind; the same out-skirt of date trees and half discarded canals; the same river fringing; the same irregular tumble down piles of mud-brick houses; with a gleam here and there from a ruined tesselated minaret or mosque of better days; the same dirty picturesque children; the same flat roofs, walled in for privacy, yet everywhere over-looked; the same wonder how the place ever got half built, and whether anything was ever new, finished, or repaired?

Goods to the value of from 15 to 20 lacs rupees from Bombay, in piece goods, pepper, sugar, miscellanies.

Goods to the value of from 5 to 10 lacs rupees from Baghdad.

Exports nearly 40 lacs rupees worth of dates, of three qualities, known as 1st, 2nd, and 3rd sorts.

Customs dues are levied according to a Tariff of from 5 to 10 per cent; the average may be 8 per cent.

* In my opinion, Faon would ill suit our purposes. Its climate and locality amid Delta marshes would render it fatal to Englishmen.

143. Yet the little creek that leads from the town steps to the main river, if unwholesome, was still very welcome. The apricot and almond in full blossom, hanging bonnily over the hedges, called back the apple and the cherrytree gladdening the orchard and greeting the road side, in a country where these objects were something more to us than to the passing foreign employé.

144. I may perhaps be expected to offer a remark or two upon the prospects that any extension of the present steam communication through the Gulf would have. I infer that the present line pays well, and that the steamers running from Busreh to Baghdad also pay. Having had occasion to visit Busreh with part of my establishment by the mail steamer, I found her first class accommodation all occupied, and was glad to be permitted sitting and dining room in the orlop deck forward. I calculated that the receipts for that upward trip of twelve days, steaming from Bombay to Busreh, must have been 45,000 rupees; and from what I subsequently learned, that her return trip must have brought in 30,000 rupees.

145. I think that some descriptions of goods would readily avail themselves of steam communication along this line; such for instance as bales of shawls and other costly packages, also copper and stores. I further presume, that a considerable passenger traffic is waiting, and might be indefinitely increased by the supply of means. Merchants would gladly pay a higher passage money to save their time, and be in advance of their coming goods. A wealthy and numerous class of Mahomedans seek Baghdad, Kurbella, and Nejd for purposes of religion and pleasant residence. The numbers of this class would doubtless augment were the ease and rapidity of the journey to become known and appreciated.

146. But my suggestion to any merchants embarking in this enterprise would be, to render their arrangements from the first public and definite, and as convenient as may be to all parties concerned.

147. Let them publish as early as practicable their probable dates of arrivals and departures, and then adhere to these. If it once becomes the general notion that the steamer will wait, Oriental traders will certainly dally, and then either the Company must lose their cargo or lose their time.

148. Be careful in the selection of Agents, and see that they fulfil their duty.

149. If it be found that the cargo-boats from the shore cannot be depended on for punctuality or in a breeze, establish independent cargo boats, and include this charge in the Bill of Lading.

150. Let the cargo brought be delivered in good condition.*

151. If a promise be made to drop even the lowest class of passenger at a certain point, let the promise be fulfilled. It is better to lose a little time in anchoring, and to expend a few extra pounds of coal, rather than to allow a whisper of breach of contract to find its way into the interior.

152. If a berth be once regularly secured, never infringe its tenant's rights in favour of a more advantageous offer; stick to contract.

153. Adapt the accommodation of the vessels to the description of passengers frequenting the route. An upstart native will push anywhere; but there are many Mahomedan gentlemen whose families were old before England was born, and who yet, partly from modesty, partly from religious prejudice, and partly from a pardonable reserve, cannot bring themselves to intrude into the European saloon. Let the best arrangement practicable be made to accommodate Orientals according to their class in some other part of the ship.

154. I would suggest to the Government to require from steamers carrying their mails that punctuality and those rates of speed which are usually now required from similar steamers on other lines. At present the dates are named only for Kurrachee and Bombay. And the result is, that if a mail steamer finds herself late at Busreh, she gives up all thought of reaching Kurrachee in time, loiters for cargo, thus detaining the Gulf, Baghdad, and Teheran letters, and trusts to some other steamer taking her place at Kurrachee on the specified day.

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* Since writing this, I have received an official complaint from the Governor of Bushire of the non-delivery of goods, and of the departure of the steamer for Busreh carrying the Bushire goods on with it.

A second complaint of the injury sustained by goods while on board.

A third complaint that the steamer gives no notice of departure, and last time left a passenger who had paid his passage-money.

In my opinion there are faults on both sides.

155. It is not my duty to speculate on the general opening up of this route as a main artery of communication between England and India; but analyzing the map, one spontaneously recalls the first lesson of Geometry, that the shortest road between two points is a straight line. A line drawn from London to a point on the Western coast of the Peninsula of India traverses the Persian Gulf. Kurrachee seems to be pointed out by nature as the place where our English telegraphic cable should enter our Indian Empire. It would of course be an advantage to have our telegraph line identical with our line of trade, and post, and passengers.

156. In conclusion, His Excellency having directed me to report on the trade of the Persian Gulf, I have now woven a thread through these sheets; but I confess at the same time that I write on trade with much diffidence and some reluctance. The remarks of a non-trader must be superficial and theoretic. In trade, as in other professions, there can be no real school but experience, acting on original capacity. And all that an outsider can do if useful, is to bring a little grist to that mill. The principles of Political Economy mathematically true in the abstract, may be rendered by circumstances ruinous in detailed practice. The merchant knows there is no workable law of commerce but to watch the market, and mistrust general maxims. To costly experience he must add continued care and forethought. His combinations are not less comprehensive and complex than those of a General. Like him, too, he must first fight the compaign in his head: and when the time comes to leave strategy for tactics, fight it over again on the decisive field of competition. Ruin or fortune hangs on a day. And when all is done that can be done, that day may still be adverse. A touch at the other side of the globe may vibrate through the whole mass he is dealing with, and disconcert his combinations at the last hour; and this I presume is the reason why the best laid plans of merchants as of mice do still go oft awry.

P.S.—I apologize to the Government for sending in the office copy of this Report; but my Clerk really has not time to make a fair copy of it before the outgoing steamer starts.

Statement of the Number of Inhabitants, Vessels, Houses, and Date Trees of the Joasmee Ports in 1826, *contrasted with the same in* 1831.

Names of Places.	In 1826.				In 1831.				Increase.	Diminution.
	Number of Men.	Number of Women.	No. of Youth and Children of both Sexes.	Total.	Number of Men.	Number of Women.	No. of Youth and Children of both Sexes.	Total.		
Shaam and Kuleela	250	300	700	1,250	250	300	700	1,250	....	..
Ramse	250	300	700	1,250	300	350	1,000	1,650	400	..
Ras-ool-Khyma	800	950	2,000	3,750	1,150	1,250	3,000	5,400	1,650	..
Jazirat-ool-Hamrah	400	600	1,600	2,600	650	850	2,600	4,100	1,500	..
Amulgavine	400	500	1,450	2.350	750	900	2,900	4,550	2,200	..
Ejman	500	650	1,800	2,950	650	850	2,600	4,100	1,150	..
Heera	100	150	500	750	250	300	900	1,450	700	..
Shargah and Fasht	1,700	1,800	4,000	7,500	2,500	2,600	8,800	13,900	6,400	..
Khan	....	....	....	....	150	200	400	750	750	..
Total	4,400	5,250	12,750	22,400	6,650	7,600	22,900	37,150	14,750	..

Statement of the Number of Inhabitants, Vessels, Houses, and Date Trees of the Joasmee Ports in 1826, *contrasted with the same in* 1831.—(*Continued.*)

Names of Places.	In 1826.					In 1831.					Increase.	Diminution.
	No. of Pearl Boats.	No. of Fishing Boats.	No. of Buggalows for Trade.	No. of Boats or Buteels for Trade.	Total.	No. of Pearl Boats.	No. of Fishing Boats.	No. of Buggalows for Trade.	No. of Boats or Buteels for Trade.	Total.		
Shaam and Kuleela	..	15	..	....	15	..	15	....	....	15	..	..
Ramse	..	15	..	....	15	..	18	....	....	18	3	..
Ras-ool-Khyma	10	15	5	15	45	14	35	10	30	89	44	..
Jazirat-ool-Hamrah	15	10	..	8	33	20	22	....	12	54	21	..
Amulgavine	15	15	..	8	38	32	25	....	14	71	33	..
Ejman	30	20	..	15	65	45	20	....	19	84	19	..
Heera	10	5	..	4	19	25	10	....	7	42	23	..
Shargah and Fasht	160	77	..	67	304	210	80	5	75	370	66	..
Khan	..	..	..	....	..	17	..	....	....	17	17	..
Total....	240	172	5	117	534	363	225	15	157	760	226	..

Statement of the Number of Inhabitants, Vessels, Houses, and Date Trees of the Joasmee Ports in 1826, *contrasted with the same in* 1831.—(*Continued.*)

Names of Places.	In 1826.			In 1831.			Increase.	Diminution.	1826.		1831.		Increase.	Diminution.	Remarks.
	No. of Stone Houses.	No. of Huts.	Total.	No. of Stone Houses.	No. of Huts.	Total.			No. of Date Trees.	Total.	No. of Date Trees.	Total.			
Shaam and Kuleela	..	250	250	..	250	250	..	..	9,000	9,000	11,000	11,000	2,000	..	Most of the fishing and trading boats are likewise employed in the pearl fishery.
Ramse	..	250	250	..	300	300	50	..	4,500	4,500	6,720	6,720	2,220	..	
Ras-ool-Khyma	200	1,000	1,200	300	1,300	1,600	400	..	28,000	28,000	38,000	38,000	10,000	..	
Jazirat-ool-Hamrah	100	300	400	300	600	900	500	..	..	..	..	..	..	..	
Amulgavine	15	400	415	27	600	627	212								
Ejman	10	650	660	10	800	810	150								
Heera	..	150	150	..	250	250	100	..	8,000	8,000	11,000	11,000	3,000	..	
Shargah and Fasht	175	2,000	2,175	450	2,600	3,050	875								
Khan	..	..	..	..	150	150	150								
Total....	500	5,000	5,500	1,087	6,850	7,937	2,437	..	49,500	49,500	66,720	66,720	17,220	..	

NOTE.—The reason of the number of houses exceeding the total of male inhabitants is, that only the fixed residents are enumerated in this list; but at certain times of the year great numbers of the Bedouins come in from the interior, and remain four or five months in the towns. Many of these individuals have fixed places of residence, which they do not remove when they take their departure.

List of Detailed Statements of Imports and Exports at Bushire, enclosed in No. 67 of 1863, *P. D.*

1. Imports into Bushire from England.
2. Exports from Bushire to England.
3. Imports into Bushire from Mauritius.
4. Exports from Bushire to Mauritius.
5. Imports into Bushire from India *viâ* Bombay.
6. Exports from Bushire to India *viâ* Bombay.
7. Imports into Bushire from Java.
8. Exports from Bushire to Java.
9. Imports into Bushire from Aden and Jedda.
10. Exports from Bushire to Aden and Jedda.
11. Imports into Bushire from Kurrachee.
12. Exports from Bushire to Kurrachee.
13. Imports into Bushire from Muscat.
14. Exports from Bushire to Muscat.
15. Imports into Bushire from Bunder Abbass.
16. Exports from Bushire to Bunder Abbass.
17. Imports into Bushire from Ports on the Persian Coast.
18. Exports from Bushire to Ports on the Persian Coast.
19. Imports into Bushire from Ports on the Oman Coast.
20. Exports from Bushire to Ports on the Oman Coast.
21. Imports into Bushire from Bahrein.
22. Exports from Bushire to Bahrein.
23. Imports into Bushire from Kuteef and Lahsan.
24. Exports from Bushire to Kuteef and Lahsan.
25. Imports into Bushire from Koweit.
26. Exports from Bushire to Koweit.
27. Imports into Bushire from Busreh.
28. Exports from Bushire to Busreh.

LEWIS PELLY, Lieut.-Colonel,
Acting Political Resident and Consul General, Persian Gulf

British Residency, Bushire, 13*th April* 1863.

Approximate Annual Imports by sea from England to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Article.	Quantity.	Value.	Duty in Bombay Rs.	
Crushed Sugar	50,000	87,500	.....	..	..	1,000	Future importations depend much upon the state of the Persian market for sugars.
Loaf Sugar	16,000	40,000	.....	..	..	640	
Flint Stones	400 Cases.	10,000	.....	..	..	Free.	This article is brought for the use of the Persian Government.
Cotton goods of all descriptions.....	....	200,000	.....	..	..	10,000	Should cotton goods continue to command the present high prices in England, future importation will not be so large.
Guns, pistols, gold and silver watches and chains.	....	10,000	Watches are imported free, but duty at ¾ Bombay Rupees is levied upon every case of guns or pistols, whether the case contains one or more of them.	..	..	....	Future importations depend upon the demand there may be.
English iron	14,000 Tabreez Mds.	5,000	.....	..	..	300	This article was re-exported to Bussora, the consumption of it in this place being very small. Swedish iron is much consumed in Persia.

Approximate Annual Exports by sea from Bushire to England, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.			Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity.	Value.	
Wheat.....	64,000	11,000	.....	....	..	This quantity was ready and about to be shipped for England on account of an English Mercantile House in the month of February 1863, per English barque the "Lavinia," Captain Hadden, when the local authorities prohibited its exportation.

Approximate Annual Imports by sea from the Mauritius to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.			Remarks as to cause of Increase or Decrease.
Article.	Quantity.	Value.	Article.	Quantity.	Value.	
.....	.....	.....	.....	....	..	Mauritius sugars are not cheap enough for this market. Vessels from Mauritius come on ballast.

Approximate Annual Exports by sea from Bushire to the Mauritius, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.			Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity.	Value.	

The Export trade with Mauritius is never regularly carried on. It would, however, be much enlarged if traders were not subjected to great inconveniences by the Governors of Bushire placing sudden embargo on the exportation of wheat. Should merchants be able to trade with Mauritius without any let or hindrance from the local authorities, the following articles would form the Annual exportation from this place for the first few years with a fair pospect of gradual increase. English merchants and others sometimes engage in the trade, but there have been no exportations this year.

Wheat	4,80,000	72,000				
Dates	96,000	12,000				
Tallow	10,000	10,000				
Ghee.....	10,000	20,000				
Grain	40,000	10,000				
Raisins	10,000	2,500				
Cummin seeds.....	5,000	3,000				
Almonds	3,000	1,500				
Mules	300	35,000				
Asses	100	2,500				
Horses (common) ..	100	10,000				
Sheep	300	750				

Approximate Annual Imports by sea from India viâ Bombay to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase and Decrease.
Article.	Quantity.	Value in Bombay Rupees.	Article.	Quantity.	Value in Bombay Rupees.	Amount of duty levied in Bombay Rupees.	
Cashmere Shawls	10,000 Pieces.	15,00,000	Cashmere Shawls	10,000 Pieces.	15,00,000	13,600	
Copper	60,000 Mds.	3,00,000	Copper	60,000 Mds.	3,00,000	Not known.	
Piece Goods, Europe	.....	6,00,000	Piece Goods, Europe	.....	6,00,000	30,000	
Sugar	2,00,000 Mds.	2,00,000	Sugar	2,00,000 Mds.	2,00,000	2,000	
Tea	2,500 Boxes.	1,00,000	Tea	2,500 Boxes.	1,00,000	2,000	
Gold Cloth	.....	75,000	Gold Cloth	.....	75,000	.....	
Tin, Pigs of	14,000 Mds.	70,000	Pigs of Tin	14,000 Mds.	70,000	500	
Spices	.....	50,000	Spices	.....	50,000	.....	
Pepper	50,000 Mds.	50,000	Pepper	50,000 Mds.	50,000	1,250	
Sugarcandy	25,000 „	50,000	Sugarcandy	25,000 „	50,000	1,000	
Coffee	20,000 „	40,000	Coffee	20,000 „	40,000	350	
Yarn	.....	40,000	Yarn	.....	40,000	1,200	
Blackwood	1,20,000 Mds.	30,000	Blackwood	1,20,000 Mds.	30,000	Free.	
Iron	13,500 „	10,000	Iron	13,500	10,000	250	
Cocoanut Oil	1,140 „	2,000	Cocoanut Oil	1,140 Mds.	2,000	Free.	
Preserves, chiefly Ginger	300 Boxes.	5,000	Preserves, chiefly Ginger	300 Boxes.	5,000	75	
Wax, Sealing	.....	1,000	Wax, Sealing	.....	1,000	.....	
Wax, Candles	350 Mds.	2,000	Wax, Candles	350 Mds.	2,000	20	
Flints, Gun	.....	6,000	Flints, Gun	.....	6,000	Free.	
Lead	7,000 Mds.	7,000	Lead	7,000 Mds.	7,000	140	
Tin, Sheets	.....	5,000	Tin, Sheets	.....	5,000	.....	
Paper and Stationery	.....	2,000	Paper and Stationery	.....	2,000	100	
Leather	.....	4,000	Leather	.....	4,000	150	
Camphor	.....	2,000	Camphor	.....	2,000	20	
Wood, Brazil	.....	4,000	Wood, Brazil	.....	4,000	.....	
Drugs	.....	7,000	Drugs	.....	7,000	.....	
Steel	.....	3,000	Steel	.....	3,000	80	
Glassware	.....	7,000	Glassware	.....	7,000	.....	
Zinc	.....	4,000	Zinc	.....	4,000	.....	
Quicksilver	.....	4,000	Quicksilver	.....	4,000	.....	
Sal Ammoniac	2,400 Mds.	6,000	Sal Ammoniac	2,400 Mds.	6,000	125	
Indigo	100 Boxes.	1,00,000	Indigo	100 Boxes.	1,00,000	.....	

N. B.—It has been found very difficult to obtain a satisfactory estimate of the Import Trade with India, owing to the multitude of petty dealers and the variety of articles each of them deal in in very small quantities. A reference to the Bombay Custom House would furnish a much more correct estimate of it than could be conjectured at Bushire.

Approximate Annual Exports by sea from Bushire to India viâ Bombay, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Duty in Bombay Rupees.	
Cotton	2,50,000	7,00,000	Cotton	5,00,000	1,40,000	2,500	The increase is expected from the continuance of the Civil War in America.
Madder root.....	1,00,000	55,000	Madder root	1,00,000	55,000	1,000	
Raw Silk	10,000	5,00,000	Raw Silk	10,000	5,00,000	500	
Gallnuts.....	7,000	28,000	Gallnuts	7,000	28,000	70	
Almonds	50,000	25,000	Almonds	50,000	25,000	500	
Raisins	40,000	20,000	Raisins.....	40,000	20,000	400	
Rosewater, Carboys.....	10,000	12,500	Rosewater in Carboys	10,000	12,500	500	
Do. in Flasks	10,000	2,500	Do. in Flasks	10,000	2,500	50	
Assafœtida.....	6,000	20,000	Assafœtida	6,000	20,000	240	
Saleb	1,200	6,000	Saleb	1,200	6,000	60	
Gum, Persia	25,000	10,000	Gum, Persia	25,000	10,000	250	
Wool	1,00,000	1,50,000	Wool	1,00,000	1,50,000	1,000	
Wheat	3,00,000	45,000	.....	.....	.....	7,600	Wheat is not usually exported to Bombay. The present exportation was owing to a rise in price in the Bombay Market.
Ghasp Dates, Baskets.....	20,000	40,000	Ghasp Dates, Baskets	20,000	40,000	200	
Cummin Seeds.....	4,000	2,500	.....	.....	.....	40	This article is seldom exported to Bombay. The present exportation has been owing to a demand in the Bombay market.
Carpets, different qualities .	.....	2,500	Carpets, different qualities.	.....	2,500	50	
Wine, Carboys.....	200	1,000	Wine, Carboys	200	1,000	100	

Approximate Annual Imports by sea from Java to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Co.'s Rs.	Article.	Quantity in Tabreez Maunds.	Value in Co.'s Rs.	Amount of Duty leviable in Rupees.	
Sugar.....	13,60,000	17,00,000	Sugar	9,00,000	11,25,000	21,600	The expected decrease will be owing to the Persian market being overstocked with an unusual quantity of Loaf Sugar. Some eighteen thousand cases, or about 3,60,000 Tabreez maunds brought into Persia *vid* Trebizond.
Cassia.....	8,500	8,500	Cassia	8,500	8,500	150	It is probable that the importation of this article will increase next year, owing to its being preferred in Persia to the Indian or any other.
Coffee.....	3,400	8,500	.....	.....	.....	68	The importation of next year will depend entirely upon the state of the Persian market, and the prices ruling in India, whence large quantities are usually imported.
Rum, Cases	300	2,250	Rum.....	None.	.....	.....	No demand, owing to the absence of the Persian Gulf Squadron. A few years back the importation was much larger.
Tin	None.	.....	.....	.....	.....	.....	This article was formerly imported in large quantities, but the high prices in Java have stopped importation.

Approximate Annual Exports by sea from Bushire to Java, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Co.'s Rs.	Article.	Quantity in Tabreez Maunds.	Value in Co.'s Rs.	Amount of duty leviable in Bombay Rs.	
Wheat	8,50,000	1,27,500	Wheat	5,10,000	76,500	12,000	The expected decrease will be owing in a great measure to want of confidence in the Bushire Government, which will prevent merchants from storing grain for fear of a prohibition.
Cummin seeds	35,000	21,875	Cummin seeds	10,000	6,250	350	The decrease is apprehended from the unpromising state of the cultivation, and want of demand in the Java market.
Bees' Wax	4,000	30,000	Bees' Wax	4,000	30,000	60	
Gram	5,000	1,250	Gram	5,000	1,250	50	
Raisins	16,000	8,000	Raisins	16,000	8,000	160	
Rosewater, Flasks	10,000	2,500	Rosewater, Flasks	10,000	2,500	50	
Almonds	8,000	5,000	Almonds	8,000	5,000	80	
Black Seeds	8,000	5,000	Black Seeds	16,000	10,000	80	The increase is expected from an extension of the cultivation this year in Shiraz and Cazroon.
Opium	8,000	4,00,000	Opium	8,000	400,000	2,800	
Gallnuts	3,000	12,000	Gallnuts	3,000	12,000	30	
Ghee	.....	.....	.....	.....	.....	.....	The present annual exportation is very small, owing to the dearness of the article here, but in good years it sometimes amounts to 20,000 mds., valued at Bombay Rs. 80,000.
Dry fruit	.....	.....	.....	.....	.....	.....	The annual exportation varies from four thousand to twelve thousand boxes, valued at Bombay Rs. 2,000 to 6,000.
Dates	.....	.....	.....	.....	.....	.....	About 30,000 baskets Bussora, and 3,000 baskets Lahsa are annually re-exported hence to Java, whereof value amounts to one hundred thousand Bombay Rupees, and duty 330 Rupees.

Approximate Annual Imports by sea from Aden and Jedda to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Article.	Quantity in Tabreez Mds.	Value in Bombay Rs.	Amount levied as duty at Bushire in Bombay Rs.	
Nothing is imported from Aden.	....	..	.....	....	..	....	
Osta Ghoddos (drug).....	2,000	3,000	Osta Ghoddos.....	2,000	3,000	20	From Jedda.
Senna Leaves	4,000	1,000	Senna Leaves.....	4,000	1,000	120	From Jedda and Hodayda.
Cassia	4,000	4,000	Cassia.....	4,000	4,000	40	From Hodayda.
Limejuice, Carboys.....	200	400	Limejuice, Carboys	200	400	20	Ditto.
Egyptian Loaf Sugar.....	2,400	6,000	Egyptian Loaf Sugar	2,400	6,000	80	Ditto.

Approximate Annual Exports by sea from Bushire to Aden and Jedda, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Amount leviable in Bombay Rs. as duty.	Remarks as to cause of Increase or Decrease.
Tobacco	28,000	17,500	Tobacco	28,000	17,500	550	To Aden.
Rosewater, Carboys	500	625	Rosewater, Carboys	500	625	50	Do.
Wheat	32,000	4,800	Wheat	32,000	4,800	800	Do.
Carpets	2,500 Pieces.	25,000	Carpets	2,500 Pieces.	25,000	500	To Jedda.
Wheat	8,000 T. mds.	1,200	Wheat	8,000 T. mds.	1,200	200	Do.
Tobacco	7,000	4,375	Tobacco	7,000	4,375	137½	To Mocha.

Approximate Annual Imports by sea from Kurrachee to Bushire, Present and Future.

Appoximate Present Annual Imports.			Approximate Future Annual Imports.			Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity.	Value.	
Lamp Oil	2,400	3,600	Lamp Oil.....	2,400	3,600	Duty free.

Approximate Annual Exports by sea from Bushire to Kurrachee, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.			Remarks as to cause of Increase or Decrease.
Article.	Quantity.	Value.	Article.	Quantity.	Value.	
None	....	....	.....	.....	....	

Approximate Annual Imports by sea from Muscat to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds	Value in Bombay Rupees.	Amount of duty leviable in Bombay Rs.	
Mat bags (Kafat)	200,000	40,000	Mat bags (Kafat)	200,000	40,000	1,600	
Empty rice gunny-bags	200,000	35,000	Empty rice gunny-bags	200,000	35,000	700	
Coffee	4,000	10,000	Coffee	6,000	15,000	60	It is expected to be cheaper next year.
Pepper	4,000	5,500	Pepper	4,000	5,500	100	
Bengal Sugar	28,000	31,500	Bengal Sugar	28,000	31,500	250	
Turmeric	4,000	3,000	Turmeric	4,000	3,000	80	
Sugar-candy	800	1,600	Sugar-candy	800	1,600	32	
Swedish Iron	4,800	3,600	Swedish Iron	4,800	3,600	72	
Steel	500	500	Steel	500	500	10	
Hides of all kinds	6,000	3,000	Hides of all kinds	6,000	3,000	150	
Tin	1,000	5,000	Tin	1,000	5,000	140	
Cardamums	150	3,000	Cardamums	150	3,000	20	
Dry Lemon	20,000	25,000	Dry Lemon	20,000	25,000	200	
Fathanee (Cutch Leather)	8,000	12,000	Fathanee (Cutch Leather)	8,000	12,000	120	
Chundles (Rafters)	4,000	4,000	Chundles (Rafters)	4,000	400	Free.	
Cloves	....	....	.....	....	....	....	This article was largely imported some years ago, but the importation has gradually decreased, so that there has been none imported this year, owing to its having got out of use in Persia. About forty years ago Cloves were worth 40 Krans the Tabreez maund and at present only 2½ Krans.
Lamp Oil (Cutch manufacture)	5,000	6,500	Lamp Oil (Cutch manufacture)	5,000	6,500	Free.	
Janpoor Indigo (Sind manufacture).	4,000	40,000	Janpoor Indigo (Sind manufacture).	4,000	40,000	800	

Approximate Annual Exports by sea from Bushire to Muscat, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds	Value in Bombay Rs.	Amount of duty leviable in Bombay Rs.	
Opium	1,000	30,000	Opium	1,000	30,000	360	
Wheat	80,000	12,000	Wheat	80,000	12,000	2,000	
Raw Silk	1,000	50,000	Raw Silk	1,000	50,000	50	
Ghee	3,000	6,000	Ghee	3,000	6,000	45	
Rosewater, Carboys	4,000	5,000	Rosewater, Carboys	4,000	5,000	400	
Cummin seeds.....	8,000	4,000	Cummin seeds.....	8,000	4,000	120	

Approximate Annual Imports by sea from Bunder Abbass to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds	Value in Bombay Rupees.	Amount of duty levied in Bombay Rupees.	
Grind Stones	150 Pairs.	200	Grind Stones	150 pairs.	200	Free.	
Henna Leaves.....	1,000 T. mds.	500	Henna Leaves	1,000 T. mds.	500	16	
Minao Indigo	1,600 ,,	11,200	Minao Indigo	1,600 ,,	11,200	Uncertain.	

A large quantity of Minao Indigo goes to Yezd through Bunder Abbass to the detriment of the Indian Indigo. Its being cheaper it is preferred by the Dyers.

Approximate Annual Exports by sea from Bushire to Bunder Abbass, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Article.	Quantity in Tabreez Mds.	Value in Bombay Rs.	Amount of duty levied in Bombay Rs.	Remarks as to cause of Increase or Decrease.
None	....	..	.....	....	..	....	

Approximate Annual Imports by sea from Ports on the Persian Coast (not Bunder Abbass) to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Amount of Duty paid in Bushire in Rupees.	
Pepper	5,000	6,250	Pepper	5,000	6,250	120	From Linga.
Coffee.....	3,600	7,200	Coffee	3,600	7,200	60	
Cotton piece goods (English)	..	8,000	Cotton piece goods (English)	..	8,000	400	
Tobacco.....	2,800	1,750	Tobacco.....	2,800	1,750	55	
Tobacco.....	2,800	1,750	Tobacco.....	2,800	1,750	55	From Assaloo.
Tobacco.....	7,000	4,375	Tobacco.....	7,000	4,375	137½	From Taharee.
Firewood	1,280,000	36,000	Firewood	1,280,000	36,000	2,000	From Taharee, Charek, & Ghoran.
Salt.....	8,000	150	Salt	8,000	150	Free.	From Kelat.

Approximate Annual Exports by sea from Bushire to Ports on the Persian Coast (not Bunder Abbass), Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Amount of duty levied at Bombay.	Remarks as to cause of Increase or Decrease.
Wheat.....	80,000	12,000	Wheat	80,000	12,000	2,000	To Linga.
Barley.....	48,000	4,500	Barley.....	48,000	4,500	1,200	Ditto.
Tallow.....	1,600	2,000	Tallow.....	1,600	2,000	27½	Ditto.
Myrtle Leaves	4,800	750	Myrtle Leaves	4,800	750	120	Ditto.

Hardly anything is exported from Bushire to other Ports on the Persian Coast.

Approximate Annual Imports by sea from Ports on the Oman Coast to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Amount of duty levied at Bushire.	
Dry Lemons.....	9,000	11,250	Dry Lemons.....	9,000	11,250	80	From Sohar.

Approximate Annual Exports by sea from Bushire to Ports on the Oman Coast, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Amount leviable as duty at Bushire in B. Rs.	
None	....	....	.....	....	....	....	

Approximate Annual Imports by sea from Bahrein to Bushire, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Amount of duty leviable in Bombay Rs.	
Empty rice gunny-bags	20,000 Pieces	3,500	Empty rice gunny-bags	20,000 Pieces.	3,500	35	
Madda Mats.....	10,000 ,,	7,500	Madda Mats.....	10,000 ,,	7,500	37½	
Juddoo	5,000 ,,	1,250	Juddoo	5,000 ,,	1,250	62½	
Date Sticks (Gorz) ..	200 Bdls.	80	Date Sticks (Gorz) ..	200 Bdls.	80	4	
Khullas Dates	2,000 Baskets.	4,000	Khullas Dates	2,000 Baskets.	4,000	20	
Syrup of Date	3,200 T. mds.	1,200	Syrup of Date	3,200 T. mds.	1,200	40	
Canvass (Bahrein manufacture)	400 ,,	2,000	Canvass (Bahrein manufacture)	400 ,,	2,000	Free.	
Pearls	.....	100,000	Pearls	.....	100,000	Do.	

Approximate Annual Exports by sea from Bushire to Bahrein, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Amount of duty leviable in Bombay Rupees.	
Tobacco	28,000	17,500	Tobacco	28,000	17,500	550	
Madderroot.....	8,000	5,000	Madderroot	8,000	5,000	110	
Cotton	12,000	30,000	Cotton	12,000	30,000	165	
Ahlook (Nuts)	800	200	Ahlook (Nuts).....	800	200	40	
Nokhod (Gram).....	800	200	Nokhod (Gram).....	800	200	40	
Jafth (Dye).....	3,200	800	Jafth (Dye).....	3,200	800	20	
Sugar	500	625	Sugar	500	625	2½	

Approximate Annual Imports by sea from Kateef and Lahsah to Bushire, Present and Future

Approximate Present Annual Imports.			Approximate Future Annual Imports.				Remarks as to cause of Increase and Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rupees.	Amount of duty levied in Bushire.	
Dates (Khunazee) ..	1,000 Baskets.	1,000	Dates (Khunazee) ..	1,000 Baskets.	1,000	5	From Katif.
Juddoo	3,000 Pieces.	750	Juddoo	3,000 Pieces.	750	37½	Ditto.
Date Sticks (Gorz) ..	2,000 Bundles	500	Date Sticks (Gorz)..	2,000 Bundles	500	20	Ditto.
Ghèl (Washmud) ..	50,000 T. mds.	1,000	Ghèl (Washmud)....	50,000 T. mds.	1,000	40	Ditto.
Madda Mats.....	3,000 Pieces.	2,500	Madda Mats.....	3,000 Pieces.	2,500	100	Ditto.
Dates (Khullass)....	50,000 T. mds.	12,500	Dates (Khullass)....	5,000	12,500	50	From Lahsa.
Black Ghèlan Abba (Cloak)	200	2,000	Black Ghèlan Abba (Cloak)	200	2,000	50	Ditto.

Approximate Annual Exports by sea from Bushire to Kateef and Lahsah, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Amount of Duty levied in Bushire.	
Silk-thread, untwisted..	100	7,500	Silk-thread, untwisted..	100	7,500	5	To Lahsah.
Carpets, different sorts..	250	2,500	Carpets, different sorts..	250	2,500	75	
Wheat	32,000	4,800	Wheat	32,000	4,800	800	To Kateef.
Tobacco	7,000	4,375	Tobacco	7,000	4,375	137½	

Approximate Annual Imports by sea into Bushire from Koweit, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				
Article.	Quantity in Tabreez Maunds.	Value in Bombay Rs.	Article.	Quantity in Tabreez Maunds.	Value in Rs.	Amount of Duty leviable in Bombay Rupees.	Remarks as to cause of Increase or Decrease.
Coffee (Malabar) ..	4,000	8,000	Coffee	4,000	8,000	60	
Pepper (do.)	5,000	6,250	Pepper	5,000	6,250	120	
Cotton Piece Goods (English).	1,500 Pieces	18,000	Cotton Piece Goods (English).	1,500 Pieces	18,000	750	

Approximate Annual Exports by sea from Bushire to Koweit, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				Remarks as to cause of Increase or Decrease.
Article.	Quantity in Tabreez Mds.	Value in Rupees.	Article.	Quantity in Tabreez Mds.	Value in Rupees.	Amount of duty leviable in Rs.	
Tobacco.....	14,000	8,750	Tobacco.....	14,000	8,750	275	
Madderroot	2,000	1,250	Madderroot.....	2,000	1,250	27½	
Ahlook (Nuts).....	3,000	750	Ahlook (Nuts).....	3,000	750	20	
Nokhod (Gram)	3,000	750	Nokhod (Gram)	3,000	750	20	
Carpets, different sorts..	500 Pieces.	5,000	Carpets, different sorts..	500 Pieces.	5,000	150	

Approximate Annual Exports by sea from Bushire to Busreh, Present and Future.

Approximate Present Annual Exports.			Approximate Future Annual Exports.				
Article.	Quantity in Tabreez Mds.	Value in Rupees.	Article.	Quantity in Tabreez Mds.	Value in Rupees.	Amount of duty leviable in Bombay Rs.	Remarks as to cause of future Increase or Decrease.
Rice.....	8,000	3,000	Rice.....	8,000	3,000	200	
Madderroot.....	40,000	25,000	Madderroot.....	40,000	25,000	550	
Tobacco	35,000	22,000	Tobacco	35,000	22,000	560	
Sugar (Bengal) ..	14,000	10,500	Sugar (Bengal) ..	14,000	10,500	125	
Ditto (Java).....	14,000	10,500	Ditto (Java).....	14,000	10,500	108	
English Iron	6,000	3,000	English Iron	6,000	3,000	60	

Approximate Annual Imports by sea into Bushire from Busreh, Present and Future.

Approximate Present Annual Imports.			Approximate Future Annual Imports.				
Article.	Quantity in Tabreez Maunds	Value in Bombay Rupees.	Article.	Quantity in Tabreez Maunds	Value in Bombay Rs.	Amount of duty leviable in Bombay Rs.	Remarks as to cause of future Increase or Decrease.
Dates, Baskets	20,000	50,000	Dates, Baskets	20,000	50,000	200	
Kidney Beans	3,000	750	Kidney Beans	3,000	750	60	
Date Syrup	3,200	1,200	Date Syrup	3,200	1,200	80	
Reed Mats (Booria)	50,000	12,500	Reed Mats (Booria)	50,000	12,500	Free.	

(True copies)

H. L. ANDERSON,
Chief Secretary to Government.

ART. VI.—*Recent Tour round the Northern portion of the Persian Gulf.*—By Lieut. Col. LEWIS PELLY. *Presented by Government.*

[Read before the Society, September 17th, 1863].

I MOVED in the Mail Steamer for Busreh, and there landing, proceeded through Zobeir in a Southerly direction across the desert and reached the sea-shore at the South-east angle of the Bay of Koweit.

As proposed in my letter No. 2, Secret Department, of 24th February 1863.

2. I passed three days under the hospitable roof of the Chief of Koweit, who received me suitably.

3. From Koweit I went on in a bugla to the little island of Machan, and thence beat up the channel, passing between the island of Boobian and the main, and so up a more Northerly creek, until I landed at Bunder Zobeir, distant only some 12 miles from Busreh. I found the channel varying from 1 to 2 miles in breadth, and with soundings throughout of from 5 to 8 and even 10 fathoms.

4. At Bunder Zobeir the bugla lay close alongside the bank, and with 4 or 5 fathoms on her outer side.

5. Landing at Bunder Zobeir, I traced the bed of an ancient canal up to the ruins of Ashooneeah, situate rather more than a mile to the Eastward of the present Fort of Zobeir.

6. Some narrow channels, one in particular, were observable running in the direction of Busreh. And I was told that in high tides canoes can leave the Shat-ul-Arab at a point 3 or 4 miles below Busreh and come out at Bunder Zobeir.

7. Leaving the ruins of Ashooneeah, I moved in an Easterly direction with a little southing across a plain, intersected in all directions by hundreds of earthen dykes, and bearing all the marks of having once been a richly and carefully cultivated plain.

8. Striking the Shat-ul-Arab at Zein opposite to Mahomera, I crossed in a canoe, and so passing along the Bamosheer, turned North-east, some little distance up the Huffar towards the Karoon, and there

leaving the main stream, tracked and dragged the canoe along a water course, through an immense area of inundated country, until I reached Dorack, the chief town of the Chaab Arabs. In fact the entire area of country contained between the Karoon on the North, Dorack and Bunder Mashoor on the East and South-eastward, and the Huffar and Bamosheer towards the West, was one unbroken tract of water or swamp.

9. The Chief of Dorack received me suitably.

10. From Dorack I tracked on up the broad canal which runs through that town for about 6 miles, and there reached some sluices which, leading out of the River Gerahee, let down a supply of water for the canal.

11. The Gerahee is a fine stream of water, which leaving the mountains in the direction of Ram Hormuz, and from another aperture in the hills, runs (along that portion of its course which I saw) with an easy current, a good silt, and a mid channel of about 8 feet deep, reaching the sea at Boozeeah.

12. I may have passed along this river for a distance of 6 miles and in this space observed it to throw off 7 or 8 noble branches from its right bank. These off-shoots had been partially improved, and went pouring down towards the Karoon and Huffar, giving water to extensive farms and rice cultivation, and then contributing to the vast swamp already noticed.

13. A little lower down than the point on which I came on the Gerahee, it passes a spot called Soobeeah, and there throws off other branches. This Soobeeah is distant only one fursac from Dorack, whence trade is brought to and fro by land carriage and shipped in moderate sized sea-going native craft.

14. The portion of the Gerahee along which I tracked was much such a river as the Thames at Richmond, but fringed irregularly with date trees, and in places alive with tortoises.

15. Landing near a place called Junjeeiah, I marched across a country intersected by canals, and in part flooded to Nahr-ool-Khatur and so on to Bunder Mashoor, and thence to Hindeean, where the fine and unfordable river of that name meets the sea.

16. Crossing the Hindeean, I proceeded to Shah Abool Shah, the frontier village between the Chaab Territory and the districts directly under the Persian Government of Bushire.

17. From Nahr-ool-Khatur to a point little to the North of Shah Abool Shah, I found the country to be one unbroken grass plain, the most magnificent I think I remember to have ever seen. In short, this plain, from the Hindeean on the South, from the hills to the Westward, slopes imperceptably towards the river system above alluded to, and the town of Dorack, and intermediate villages, and Bunder Mashoor form points on the curving line where the grass land sinks into marsh or flood.

18. From Shah Abool Shah I went through Bunder Dillum, Hussar, Gunaweh, and so to Bunder Reegh.

19. The district of Gunaweh is of ancient date, and strewn with the traces of vast cities. Its plain is rich in soil. The bed of an old river, at present a salt water creek, passes immediately under the Southern walls of the ancient ruins of Geramha, and is called Kuleel. This course was once a fresh water river, and the bordering plain cultivated throughout. An earthquake choked the river near its source, and turned it towards the Hindeean line and elsewhere. Hence in part the present desolation.

20. From Bunder Reegh I moved through the districts of Rohilla, and so round the creek of Bushire.

21. I beg to enclose an interesting journal of the route with which Doctor Colvill has favoured me. The botanical specimens and a few objects of curiosity collected en route I am respectfully forwarding to the Honorable William Edward Frere. Doctor Colvill was of much general aid to me en route, showing himself to be an officer desirous of taking an interest in whatever may be around him. His aid to the poor was of real service to the people, and was appreciated. The sick and the fancy sick flocked daily to Dr. Colvill.

22. We travelled lightly in a rowtee. It is creditable to the endurance of our servants that they stood the cold and the fatigue of the trip without a murmur or gloomy looks. During the last 192 consecutive hours of the march, they may have been engaged 26 hours in the canoe, 66 hours in the saddle, and 14 hours striking, pitching, &c. independently of miscellaneous work.

Two Mussulman Orderlies.
A Portuguese Cook.
A Mahometanized Portuguese.
A Mussulman Indian.
A Baghdadee.

23. I found that every detail I had received of the country to be traversed was quite erroneous. The distance to be gone over proved to be at least double what it was assumed to be. Some precaution became necessary to prevent delay. At one time I was entertaining 23 ponies on the right and 20 mules on the left bank, besides a bugla.

24. The cost of the journey properly falling on Government, is as per margin; of this the travelling expenses for February were submitted in the accounts of 28th February, the balance will be drawn for on 31st March.

Travelling in February 1863.....	Rs.	287	1	4
Travelling in March, money presents inclusive..	,,	712	10	10
Total....	Rs.	999	12	2

25. The journey was of course exceptional, consisting of forced marches and extraordinary travelling expenses; to defray these by the usual method of travelling allowance seemed to me to be unfair. I resolved therefore to perform the journey as cheaply as was practicable, and charge the amount fairly falling on Government as a special charge. It is agreeable to add that this amount is less than that which would have fallen to us had we drawn travelling allowance and marched at the usual rate.

26. I am acknowledging the politeness of the Koweit Chief by sending him a gold watch and chain, also 3 yards of red broadcloth to the Wakeel of the Chaab Chief: for these disbursements from my Toshakhana also I have to ask sanction.

27. This journey has been to me one more lesson in the truth, that there is no way of gaining a useable knowledge of these countries, but to go yourself and see them, and work your way through them.

28. Appended to Doctor Colvill's journal is a sketch map of the head of the Persian Gulf, showing our route. This sketch has been very carefully prepared by Doctor Covill from a calculation of distances based on the time we were actually on the march. The direction of our march was taken daily and from hour to hour. It is an independent proof of the approximate correctness of the calculations that, although traced apart from any chart, they fit in, unless for points where, as in the instances Bunder Mashoor and Dorack, the chart is erroneous.

LEWIS PELLY, Lieut. Colonel,
Acting Political Resident and Consul General Persian Gulf.

GULF OF PERSIA.
Shewing our route from Bussorah to Bawsil, and thence by Lahsen, Mohammerah, and the Country of the Chaab Arabs to Bushire.

Towards the end of last February I was directed to accompany the Resident on a tour round the Northern portion of the Gulf of Persia.

The trip seemed so interesting, that I made a few notes on the road.

We left this in the Mail Steamer, and after some delay, anchored at the mouth of the Bussorah Creek on the evening of the 27th.

February 28th.—This morning we got twenty baggage and three riding horses in from Zobaire, and at 4-20 P. M. mounted. We rode for two hours at the rate of four miles an hour, direction South-west to Ashereah. Then half an hour, direction West South-west, to Zobaire, and encamped at the East gate.

Zobaire is a town surrounded by a mud wall and containing about 3,000 inhabitants at most, who are principally engaged in supplying carriage to Bussorah. The inhabitants are Arabs of a Mongrel breed, contaminated by their proximity to Bussorah. The Sheikh seemed inhospitable. Five minutes walk SE. of the town is a large spring of good water flowing out of the ground in sufficient quantity to supply ten thousand men. This place is called Brimeah. The ground round is covered with ruins. The size, colour, and general appearance of the bricks the same as at Ctesephon. There are also the remains of a large modern house, with a few patches of cultivation and a small round tower by the side of each well as a protection to the cultivator.

March 1st.—Hard frost; mounted at 11-25 A. M., rode SSW. for one hour, then South for three, at the rate of four miles an hour to Salphoon. There are three square enclosures or forts here, with as many large wells inside of them. The water is bitter, but drinkable. The ground watered by those wells is cultivated with garlic and lucern grass. Wheat and barley do not grow here. There was no barley or straw for the horses, no bread for the men, and little or no brushwood for fire. The sheep have nearly all died from the cold, which this year is excessive. One hour to the West of this place is a large hill, a capital land-mark, called Isphuan.

March 2nd.—Hard frost; skins for holding water frozen. Mounted at 6-10 A. M. and rode due South over a desert of pebbles and jungle grass alternated, with here and there the shallow beds of

nullahs. After riding two hours we turned a little to the West of South to avoid the Bedouins.

At 3 P. M. the sandstone began to crop out where the gravel had been, and thus continued till 5, when the soil became much richer, covered with young grass and low brushwood.

At 5-52 P. M. we encamped in the bed of a nullah to escape being observed by the Arabs. We travelled this day at the rate of 3 miles an hour.

March 3rd.—Mounted at 6-55 A. M. and rode South over beautiful undulating plains covered with grass and flowers. At 10 A. M. we had a false alarm. A body of men was seen approaching from the South, but it turned out to be a party belonging to Zobaire returning from Koweit. There is at present a blood feud between the keepers of our baggage animals, who are Zobaries, and the Bedouins at present wandering here about. Only three weeks ago a number of sheep were stolen from Zobaire, and five Bedouins killed. 11 A.M. passed through a gap in a low range of sandstone. We saw this gap yesterday, and it forms a capital landmark, where there is not even a path. We then rode for an hour over a low plain, with the sea on our left to Jahrah. This place belongs to Yusuf bin Bider, a merchant of Koweit. It consists of three large enclosures or forts, and about a dozen small gardens, and outside those a couple of hundred acres of barley cultivation. It is said that there are 100 inhabitants in the place with flocks of sheep and plenty of water. There are a dozen small wells of good drinking water on a patch of white ground to the south.

Standing on the highest tower of the fort and looking North about three miles off, is the low sandstone range stretching from West to East, and then bending Northward round the margin of the bay of Koweit.

Eastward is the bay or harbour, and looking along its Southern margin in the distance, may be seen the town itself To the South and West is an undulating country covered with grass and flowers, but no water. Water is sent from this to the shepherds of those plains on camels. Here Yusuf bin Bider collects his horses before sending them to Bombay, and feeds them up on the lucern grass produced on the farm. The place is said to be very healthy, and the air dry like that of Baghdad.

March 4th.—Yesterday evening we were visited by Moombarek, the second son of Sheik Subbah, Chief of Koweit. He had been sent out here by his father to accompany us into town. Suliman, a son of Yusuf bin Bider came with him.

To-day we mounted at 6-30 A. M. and rode East and a little South, with the sea on our left through a low, flat, salt plain, here and there slightly raised with sand and a little grass, something like the links of Scotland.

After two hours our direction was East and little North. We now met Sheik Abdullah, the eldest son of Sheik Subbah. He came out mounted on a fine camel with a number of horsemen, and after the usual salutations, we moved on and arrived at the gate of Koweit at 11-52 A. M. A very good house, with the courtyard opening on the harbour, and consisting principally of one long room, had been prepared for us.

Scarcely had we entered it, when Sheik Subbah himself came. He is a fine, stout, hale, old man, upwards of 80 years of age, rough in appearance and manner, but kind at heart. He has a son only about five years old. He sat a long time and seemed pleased and contented with his lot. Ours was an open house constantly filled with Arabs, but being the month of the Ramazan they would neither smoke nor drink. However, in the evening after sunset, Moombarek, Dowad, and Suliman would drop in and have a cup of tea with a cheroot.

March 5th.—This morning we visited Sheik Subbah. He sat in a ruin which had been his father's house, on a coarse reed mat manufactured at Bussorah. He was very kind, and told us all of the origin of his family and the rise of Koweit. He told us how his father, grandfather, wandering Æneas like, first settled at the top of the Boobian Khore, and there plundered caravans from Bussorah, and vessels coming down the Shat-ul-Arab. Driven from there he sailed for the ancient Granensis, and founded the city of Koweit a free port.

Koweit is a compact town of about 15,000 inhabitants, built on a promontory of loose sandstone covered with sand.

Vessels of 50 or 60 tons bear the produce of the countries at the Northern end of the Gulf from Bizea, Dillum, Ghonawah, Bunder Reegh, and the smaller seaport towns round to Koweit, for transhipment to bugalows, for conveyance to Bombay. In the same way goods

from India are brought here in large bugalows and distributed amongst smaller ones for conveyance to those smaller ports.

Teak is imported and used for ship building, and a large number of horses, the best exported from Arabia, are sent from here to Bombay.

The Bedouins assemble daily in a space outside the gate, and with them there is a good sprinkling of the Slubba. The Arabs come generally mounted on camels, bringing ghee and truffles, with donkeys bearing brushwood and camel's dung. Sometimes, when hard up, the Arab will bring in his horse for sale, but good ones are seldom got in that way.

The Slubba are a strange people, living on the flesh of the gazelle, which they shoot, and dressing themselves in its skin.

They wander about amongst, and are friends with, all the Arab tribes, and yet remain entirely distinct. What their religion is I cannot tell. They adopt some of the forms of the Mahomedan faith, but at feasts and marriages they raise the cross as a sign of rejoicing. They are the best guides for the desert, knowing where water is to be found and the position of the various tribes.

Those of them I saw seemed much more intelligent than the Arabs, and they have more of a European than an Asiatic cast of countenance. They come mounted on large white donkeys, bearing much the same things as the Bedouins for sale.

The saddle is peculiar. There is first a pad in front, and behind an upright piece of wood. To those two pieces of wood hollowed out are attached side by side so as to form a hollow seat. They sit in this hollow seat, cross their legs like tailors with the anterior upright between their thighs, and their feet on either side of the donkey's neck. They use no bridle.

The inhabitants of the desert are allowed to enter Koweit on depositing their arms at the gate; and it has been the custom from the time of the present Sheik's grandfather, to feed not only all who enter, but the poor of the place besides.

This is a very healthy town; there is little or no ophthalmia at any time, and very little intermittent fever. There has been no small-pox for long. The chief diseases seem to be syphilis and gonorrhœa brought from Bombay, and the consequent secondary syphilis and stricture.

The disease next in frequency is rheumatism, but that is more prevalent at this season of the year than at any other.

The drinking water is slightly brackish, but very much better than that commonly used in Bushire. The best wells are about half a mile south of the town.

During the hot weather the nights are said to be always cool, and during the day the hot dry blast of the desert is tempered in its transit over the bay. Indeed, the fact that amongst the wealthier classes here there is no Serdaul or underground room as in Baghdad, and no Arcesh or open room on the roof, as in Bushire, shows that the climate is much more temperate than at either of those places.

March 7th.—It was our intention to have left Koweit in the early morning, and our vessel was to have been launched with the midnight tide. But by some mistake she was still high and dry on the beach. And the good old Sheik was so vexed, that he sat the whole forenoon on the shore watching the rising of the water, and sent word as soon as the boat was floating. We left at 12 o'clock. The size of the vessel was about 40 tons. Wind ENE. We sailed for the mouth of the Khore, between the Island of Boobian and the mainland, 330 steered E., Pelecchee town bearing ESE. A bank called Subea to the Northward of us. A low island called Meschan right ahead. The Khore which we wish to enter N. by W. of us; anchored 7 P. M.; set sail 12-30 midnight; passed the Kaser Subea on the mainland at the entrance of Khore. This Kaser Subea is a mere square enclosure belonging to the Sheik of Koweit, and uninhabited. Direction of the Khore here N. and about one mile and a half broad.

March 8th.—Wind North-west strong. General direction of the Khore North-west by North. The wind is blowing a moderate gale, and but for a strong tide running up, we should be unable to make any thing. However, with the assistance of the two tides we have got to the top of Boobian Island. The portion of the Khore passed to-day is a good mile broad all along, and we never got less than 5½ fathoms in the middle. There are a good many boulders, especially along the Eastern shore. The rising tide covers both banks for some distance inland, so as to make them swampy. Beyond is a sandy waste impregnated with salt, and here and there a few tufts of brushwood. There is only one place where a landing can be conveniently effected, and

where brushwood is got in any quantity, that is on the Western bank about two-thirds of the distance from the Southern end.

The Island of Boobian is a desert. There are no date trees as marked on the chart. There is no habitation and no fresh water. This Khore now runs East North-east round the top of Boobian, and opens into the Khore Abdullah; but a small off-shoot from it about 40 feet wide runs North ¾ West.

March 9th.—Still blowing a gale of wind from the North-west. Track up this off-shoot, which is about 5 miles long, and in the afternoon anchor at its opening into a much larger Khore. This larger Khore is about 250 yards broad, and opens from the Khore Abdullah.

March 10th.—The wind had abated a little in the night and become slightly favourable, so we had sailed in a North-westerly direction along this larger Khore.

7 A. M.—Said to be about four miles from Bunder Zobaire. The Hill Isphuan is West South-west of us and about 15 miles off. This Khore is still about 250 yards broad with about 5½ fathoms of water, and inhabited by shoals of porpoises. Half a mile from Bunder Zobaire it ends and divides into four or five small creeks like the fingers of a hand. We drift up one of those creeks and arrive at a hard bank called Bunder Zobaire. There are no houses. Here our baggage animals are waiting for us. We told the Zobaires to make the best of their way to this place. They were all armed with flintlocks, but besides that, each man purchased a spear, and one fine afternoon, without telling any one, they slipped away from Koweit. By-skirting the bay and then going North, they escaped the Arabs, and after travelling a day and night arrived here in safety.

Mounted at 1 P. M. and rode North-west by North along the bed of an old canal called Nar-el-Ashre, to the ruins of Ashereah, which we reached at 4-30, and encamped for the night.

The rate of travelling to-day 3½ miles an hour. Ashereah is said by some to be the remains of the ancient Bussorah. It consists of a mass of mounds of earth, bricks and broken vases, as such as are commonly used here for holding water. The bricks have the same appearance as those at Brimeah. There is one pillar about 50 feet high still standing. It seems to have formed the corner of a building, for

arches have abutted against it at right angles. But it appears to be of a much later date than the surrounding mounds.

March 11th.—Mounted at 5-30 A. M. Rode East and a little North through a desert filled with a net-work of canals and collections of mounds, apparently the remains of villages. The greater number of the canals are parallel about a hundred yards apart, and run North and South.

Tradition has it that rice, wheat, barley, and in fact all kinds of grain were cultivated here, and that the water for irrigation was brought from Gurmut Ali, about 4½ miles above Bussorah.

We arrived at Zein, on the right bank of the Shat-ul-Arab, almost opposite Mahommerah, at half-past twelve.

The kit and servants were placed in what is called a cargo-boat, and we ourselves crossed the river in a bellam.

We were dragged over an island of mud, and arrived at Mahommerah about half-past two in the afternoon.

Here we expected to find our horses and mules from Bushire, but we could neither see nor hear anything of them.

The best thing then to be done was to push on to Dorak. To this place there are two ways. One by the road, a journey of three days, and the other by water along a canal, a journey of twenty hours. We chose the latter, and by eight in the evening we were moving in two large bellams along the Bamsheer; but scarcely had we got to the Northern end of the town, when the boatmen struck work. One had his dinner to eat, another his pipe to smoke, while a third, because it was the Ramazan, declared he would not go till morning. We then sent to the Sheikh, and his uncle soon appeared with a message, that if the boatmen did not at once, and that quickly, take us to Dorack, if ever they appeared in Mahommerah again, they would have their throats cut.

The threat appeared to convey some meaning, for it had the desired effect. The men moved at once, and for fifteen consecutive hours worked incessantly without a murmur. We pulled along the Bamsheer that night for two hours and then made fast to the bank.

March 12th.—At 3 in the morning we again started and tracked at the rate of two miles an hour along the Hafaah, and at 6 entered the Nal-el-Felaheah or Dorack canal.

The canal here is about 16 feet wide, and runs East and a little North.

At 10 A. M. we came to cross canals, one running North to the Karoon, another South to the Bamsheer, while the Nar-el-Filaheah having suddenly become very much narrower, continued its original course. The whole plain round is under water, with the exception of the narrow bank on either side of the canal, and that is in many places broken through. But it looks more like a country deluged by rain, and in the hot weather it is dry, than an ordinary marsh. Those parts of the plain where the water is shallow, are covered with coarse thick grass, but no reeds. Reeds 12 and 15 feet high are however abundant in the canal itself, in many places leaving a passage just the breadth of the bellam.

The country round is covered with geese, ducks, teal, storks, cranes, plovers, and sandpipes, and during the day we must have seen at least a dozen wild boar.

On the bank of the canal is the tamarisk just getting into flower, the dwarf tamarind and camel-thorn. During the early part of the day we could see vessels to the North of us sailing up the Karoon. At 5-45 P. M. we passed Khanafra, a village of about fifty reed huts.

From this to Dorak the canal is kept in good repair. It is widened, deepened, and cleared out, and here at every twenty paces is a drain to lead the water from the canal into the cultivation.

At 7 P. M. both banks were covered with date trees and gardens, and we tracked up between those till 9, when we arrived opposite the Wukeel's house, and pitched our tents under a mulberry tree.

We had scarcely arrived, when a drunken Moolah, a Persian, came with all manner of offers and protestations, as he said, from the Sheikh; but next morning he drew in his horns and became a very small man.

The Chief of the Chaab Arabs is Sheik Lufta-ibn-Badr, but he is at present at Shuster, settling a dispute between Sheikh Jabar of Mahommerah and himself.

His nephew Sheikh Farass-ibn-Graith for the present rules in Dorak.

March 13th.—It was very difficult to form an idea of the size of Dorack or Felaheah as it is generally called by the natives; for the place is not only straggling in itself, but there are so many date trees, you cannot see it all at once.

The houses are made principally of reeds, only a few are of sun-dried bricks.

There is a broken-down mud wall with ruined bastions, made to enclose a much larger town. Between the wall and the houses it is all swamp: beyond all marsh. The whole affair looks like a bad edition of Baghdad on a small scale.

In the forenoon I wandered through the town. I was soon followed by a small army of matchlockmen and children. After staring at my dress they discussed my cigar. One wise-acre made sure it was a kind of Nargelah, but most believed it to be a Sebyle, and the length of time it lasted seemed to tickle their fancy greatly. They then discussed the important problem as to whether I ate pork, to which the servant behind me, a Seedy, swore by all that all is holy I never touched it.

The bazaar is a miserable place built of sun-dried bricks, imperfectly covered with matting. There are not above twenty shops in it; most of the shops are in reed-huts.

The people are very much like the Madan on the banks of the Tigris, but better dressed and much more sickly. All the men wear black turbands, and carry long flintlocks manufactured in Baghdad.

I should not think that there are more than two hundred houses in the town itself, but the suburbs are populous.

The climate here is said to be very bad. For three months at this season it is endurable, but in the hot weather it is dreadful. Bussorah, and we all know that is bad enough, it is said is paradise compared with it. In the hot season, during the day, the wind is hot and moist, and the water is hot and no means of cooling it in the night, the people lie panting for breath. Fever commits great ravages from the time of the cutting of the dates to the falling of the first rain, that is, from July to December, and then the inhabitants, it is said, die in hundreds, especially the Persians.

The principal diseases at present are ulcers, caries bone, rheumatism, and a little ophthalmia. Among my numerous patients were two Persian ladies. They seemed to have no love for the Arabs. They called them a set of savages fit only to eat and pray, and when they cleansed themselves, which was seldom, they went to the river, as they had no bath. The appearance of these ladies' skins would seem to justify the assertion that there is no bath in Felaheah.

One hour south of this place is the village Bizea, on the bank of the River Jaraihee.

From one to two hundred vessels of from 50 to 60 tons burden are said to arrive here yearly and carry away rice, dates, barley, wheat, and horses.

But so difficult it is to obtain accurate information even on the spot, that while one, an intelligent Jew, a native of Baghdad trading here, declared that many horses were exported to Koweit and thence to Bombay, another man, apparently equally intelligent, told us that none were exported.

Towards the afternoon Sheikh Khumfeis bin Mahomed, an intelligent little fellow, about 12 years old, paid us a visit. He was dressed up as a Sertip or Lieutenant-Colonel of Persian Infantry, and wore a hat very much on one side of his head. His grandfather says he rides bravely and shoots partridges on the wing, a great accomplishment in these countries. Later in the day Sheik Farass himself came, accompanied by his son Mahomed Sertip. The old gentleman seemed about 40 or 50, but rather dissipated in appearance.

The Sertip had been some time at the court of the Shah, and looked as if he thought himself a degree better than his country relations.

They professed great friendship, were profuse in their offers of assistance, and after a time departed. One of them of course wanted medicine.

While walking in the evening with the Resident, I felt my arm touched. It was little Sheikh Khumfeis who came for caps for his rifle, and medicine for himself. On returning to the tents we made him quite happy with a box of caps, some powder and shot, and a large bottle of physic.

An hour and a half after sunset we visited Sheikh Farass. Passing through an extensive courtyard, we entered a large hall of sun-dried bricks. At one end were fine carpets and felt rugs, with one rickety old chair. Two English candles in glass candlesticks of different shapes were placed on the carpet. At the other end I could just trace the outline of many attendants, for there was only one oil lamp, scarcely sufficient to make darkness visible. It seems we arrived too soon, Sheikh Mahomed Sertip and a number of the heads of the people

were present, but Sheikh Farass had not arrived However he soon appeared, jolly drunk and full of apologies.

We laughed and talked for an hour or more, the Resident a little nervous about the chair.

We drank coffee and tea, smoked chibouks and narghellas, ate sweetmeats, and sipped sherbet. In fact it was a mixture of Persian and Arabic customs. In the Sertip Colonel Pelly found an old acquaintance. They had met in former days at Teheran in Mrs. Taylor's house.

While talking nonsense, Sheikh Farass suddenly asked what England would do if Persia attacked Afghanistan. Shortly after we took our departure.

On leaving, some of the attendants asked Mirza Hajee Ahmed if we had not got a little brandy to spare.

Travellers visiting Felaheah should be recommended to keep one eye always on their kit. We went home that night and slept on all our valuables.

March 14th.—On leaving Dorak, we were advised to proceed as far as the village of Jungereh by water, as the road was very much cut up by canals, which laden mules would find considerable difficulty in crossing. So we sent our animals on to wait for us.

We started at 6·5 A. M. in two large bellams and tracked Eastward along the Nar-el-Felaheah, between date trees, which extended along both banks of the canal for about two miles. We then got into the open country with half a dozen groves of date trees round us. Our rate of travelling was a little more than two miles an hour.

At 7·45 we arrived at Khuzena or the Sluice. We were now on the right bank of a considerable river called the Juraihee, and here we found the origin of the Dorak canal. Here it opens from the river through a hole lined with reeds to prevent the water washing away the bank.

This river Juraihee is said to come out of the hills at Ram Hormuz, to flow past Bizea, and to open into the Shat-ul-Arab at Ghuzba nearly opposite Faou; but that would seem to be a mistake, as the Bamsheer runs down almost parallel to the Shat-ul-Arab and on its Eastern side. This river is about forty yards wide; its general depth is 8 feet, and it is deep up to the edge of both banks; but at the place we met it, it may

be forded, the water reaching up to a man's armpit. The force of the current is about two miles an hour.

We found a large sharp-bottomed boat, and by 9 o'clock having got all our things into it, we tracked up the left bank.

The river winds through a flat country much drier than that round Dorak, well cultivated, and well peopled with plenty of sheep, horses, and donkeys.

Boats, the size of the one we were in, that is about four or five tons, go, it is said, to within four fursaks of Ram Hormuz, and take five days to do it. There are many of those boats on the river. A native statement says 1,000.

9-25.—Reached Kotasha on the right bank. This is a village of a few reed huts and a knot of date trees.

Families of Arabs were here seen travelling along the banks with donkeys, bullocks, dogs, and kit, just as on the Tigris.

The river winds very much near this place. General direction ENE. Here we saw ropes half a foot in diameter, excellently well made of reeds, placed so as to prevent the bunds of the canals falling into the river. Patches of date trees extend along the left bank for half a mile, and now along both banks for a quarter of a mile to Elboneim.

Elboneim is a village also on the right bank, and about the size of Kotasha.

10 A. M.—Three miles away from the river South of this, is seen the village of Jungereh, situated on a canal of that name; it consists of about seventy reed huts and lies in a country intersected by canals.

Date trees now extend along both banks at intervals up to a place where the river takes a sudden bend and widens considerably. Here we arrived at 10-22 and found our horses and mules waiting.

12.—By this time our mules were packed, and glad to have mounted our own riding horses, we skirted a small sheet of water, and then went ESE. at the rate of three miles an hour.

12-51.—We passed a large Nebbuck tree, as it is called by the Arabs, it is the *Zizyphus lotus*. It forms a very good landmark. We were now in the district of Jabar, and to our left about two miles is the village of that name. Jabar it is said can turn out six hundred matchlockmen, the best of the country. They belong to that division

of the Chaab called Elbockbesh. Now the Elbockbesh inhabit all the country between us and the sea, Westward to the Shat-ul-Arab, and Eastward to Bunder Mashoor, it is said to be nearly all marsh land.

1-15.—Crossed the Nar-el-Jubar at its division into six small canals. The water was up to the horses' girths.

1-35.—Three miles to our right is a village called Moreied.

2-54.—Encamped at a village of about ten huts, half a mile to the Westward of a small Iman called Abdul Hassan.

This is in a district called Khater, and watered by a canal of that name. Attached to each hut is a little garden full of garlic and beans.

The plain over which we rode to-day was intersected by a network of canals, the large ones coming from the river, and the smaller from sheets of water of which there are many. Round those sheets of water patches of wheat and barley had been sown.

The rest of the country had very much the appearance of the Mesopotamian desert, three hundred yards from the banks of the Tigris.

There was abundance of tamarisk, dwarf tamarind, and camel-thorn, especially on the banks of the old nullahs.

Here also is a shrub in abundance called by the natives Aousedge, a species of *Physalis*, used for surrounding their villages; also Gagillah as they call it, a species of *Origanum*. This they eat in great quantities with bread, and Shnam, a kind of Salsola, which they burn for the alkali it contains. Unfortunately we arrived here too early in the year, as, with the exception of the *Physalis*, there was nothing in flower.

March 15th. 5-35 A. M.—Mounted and rode E. by S. At 6-10 the canals ceased, the ground became higher, brushwood less, but abundance of young grass. The plants seemed to be no farther advanced than they were at Bushire in the middle of February.

It is said we shall find no water between this and Bunder Mashoor.

At 6-30 we passed over a dry sandy plain rising gradually towards the South-west.

7-30.—A splendid plain, as far as the eye can reach, of nothing but young grass, with flocks of sheep, herds of donkeys, and the black

tents of the wandering Madan. We dismounted at a few of these tents. The shepherd told us that they belonged to the Elbockbesh; that the grass on the plain would grow much higher and thicker and last for two or three months more; and that, after that they would take their animals on fursack to the South, where there is marsh ground with abundant pasturage all through the hot weather; and there they said they cultivate wheat and barley.

Here we found a sick little Arab maid anxious for medicine, yet afraid to ask, as she had no money to pay for it. What was her surprise then when she not only got the medicine free, but a little pocket money besides. She was really grateful.

Our direction was now E. by S. By 9 o'clock the grass became less abundant, and at 9-15 we entered a bare plain only slightly tinged with green, and it thus continued till 11-45, when we reached Bunder Mashoor.

Bunder Mashoor is a miserable place, half in ruins, built on a mound apparently artificial. The number of permanent inhabitants does not exceed three hundred; besides those, there is a small floating population of merchants from the Gulf towns and their agents. Only few of the natives speak Arabic, and they dress like the Persians, but seem to be of a mixed breed.

From 40 to 50 bugalows of about 60 tons each arrive here yearly, bearing coarse cloth, corn, and dates from Bushire, Koweit, and Bussorah, and carrying away wool.

At present there is abundance of rain-water South-east of the town, but in the hot season the inhabitants depend on wells which furnish only brackish water.

The vessels in the creek are about three miles off and bear S. by W. Ophthalmia is the prevailing disease here. I treated thirty-five persons suffering from it, nearly one-eighth of the whole population. There is little or no intermittent fever at any time.

Here I met an Arab who had been sent by Sheikh Farass all the way from Dorak for medicine. I gave it with my compliments that Bushire was not far off from Dorak by sea, and any time the Sheikh required more, he had only to write and I should be most happy to send it.

But I had another patient, an Arab, able-bodied to all appearance, who came from some village near which we had passed. He walked by the side of my horse the whole morning and told me his tale.

He had two wives, one had done him service for ten years. To the other, young and beautiful, he had been married ten months; but it was a marriage only in name, and should it remain so for a year, the Sheikh of the village would claim the maiden as his own.

The disconsolate husband looked up to the English Hakeem as all powerful to assist him.

March 16th, 5-45 A. M.—Mounted and rode ESE. over a plain of dark-brown alluvial deposit with very little grass, and no animals of any kind unless the Pterocles Arenarius here certainly in great numbers. Delayed for twenty minutes by a loose mare.

8 A. M.—The plain now rose gradually before us and was covered with grass.

The hills stretched along our left front about twenty miles off. There were three ranges. A low one in front, a second about three thousand feet high behind; and behind that again in the distance a great snow range.

9-30.—Direction SE. Here we found flocks of sheep and half a dozen tents. The shepherds said they belonged to the division called Humdan, and were immediately under Sheikh Farass. In the hot weather they take their sheep to the Hindeean. There is rain water four hours off to the North of this, and there these people send for it. Passed a few herds of gazelle.

12.—Direction SE. by E. The town of Dey-Mollah is said to be four fursacks to our left.

2.—A barren plain only slightly tinged with grass, with many herds of gazelle.

Our general direction NE. by E., but for the last two hours our guide had been deviating first to the right and then to the left, and now looking rapidly round, he went off Northwards by himself on pretence of finding a road and tried to bolt for it. The Resident however quickly caught him up and brought him to his senses. Something was now seen on the mirage still further North. I went in pursuit with my servant, and after a gallop of three miles, found a man driving sheep. He was hurrying them away from us, and as we ap-

proached he levelled his firelock at Yusuf, but turned again. Now there was only one thing for it. Go at him; and before he could screw up his courage to fire, we had closed with him. He certainly thought his last hour had come. Panting for breath he stood holding in his left hand his firelock, and his right grasping a large pistol in his belt. When asked the road to Hindeean, he could make only a sign, and it was some moments before he could recover speech. He then expressed his astonishment that his sheep were still there, and he not a dead man, and it was not till we had explained to him who we were, what we were doing, and where we were going, that he became sufficiently composed to show us the way by which he had just come; and even after we had turned to go, it was evident he could scarcely believe we had left him unmolested; but after we had gone a little, he bauled out an invitation to dinner, which was declined.

4-45 P. M.—We were now passing over a beautiful plain rising gently towards the South and covered with nothing but young grass.

The town of Hindeean lay in front of us, and looked well in the evening sun, and to our left about ten miles off was the low range of hills.

All the way from Imam Abdul Hassan, in the district of Khater, to this has been one uninterrupted plain without either canal, nullah, or river, and devoid of water unless at Bunder Mashoor.

The road to Dey Mollah seems a pretty well-beaten track, indeed, it is the way almost invariably used to get from here to Bunder Mashoor, and then it is made a two days' journey. By the plain over which we came there is no road; after rain it is a swamp, and before rain there is not a drop of water.

5-20 P. M.—Encamped on the right bank of the Hindeean.

Our tents were pitched on a strip of cultivation between the river and the town. Looking up the bank we saw ten fine old cedars, and across the river the ruins of a village and ground cultivated with beans and barley, and watered from three or four wells.

The town of Hindeean is in ruins. It might at one time have held from three to four thousand inhabitants, but at present there are not above four or five hundred.

Buggarahs come here from Koweit and Bushire, but the trade seems small.

Ophthalmia is the chief disease, but not so prevalent as at Bunder Mashoor.

The river, which is said to rise near Shiraz and flow past Behbehan, is here about one hundred yards wide, with banks fifteen or eighteen feet high. Bellams can go up near to Behbehan, but not to it, on account of rocks and the shallowness of the water ; but by caravan it is only two days, seven fursacks from this to Zeidoon and from Zeidoon to Behbehan, not quite so much.

The ferry-boat was lying on the bank full of holes and half full of mud, and but for a chance bugalow from Koweit, we should have had to make a raft or invent something to cross our kit on.

March 17th.—Having crossed the river, we rode in a direction E. by N., the three ranges of hills in front of us the lowest only about six miles off.

2-40.—Rode East over a plain rising gradually towards the South and sloping down to the foot of the hills.

At 4-25, a mound was seen about four miles to our right. The guide called it Tol Morgei, a house of the Ghebers or Hindoos, or in fact whatever he thought would please, for he was a Persian.

The mound was the remains of a house built of fossiliferous sandstone on a sandy flat, covered by the sea at high tides. It did not seem of very ancient date.

At 5-15, we found sandstone filled with fossils of marine mollusca cropping out; the same stone as that Tol Morgei had been built of.

At 5-30, our direction was East over a barren Mashelah with the sea to our right, and at 9-50 P. M. we arrived at Shah-bool-Shah or Sheik Abdullah as it is called by the Arabs.

Our road after dark was through a salt plain intersected by many shallow inlets from the sea with here and there mounds of sand and brushwood.

We heard the waves nearly all the time, and at 8 o'clock we passed along a bank which bordered on the shore.

Sheik Abdullah is a miserable village of about twenty houses, half in ruins, and a small tomb with a white dome. It is built on a low sandy shore. The place has no trade, and does not possess even a boat.

The inhabitants are a sour, fanatical-looking race, if not something worse.

When we arrived at night they would give us neither milk nor water.

It must be remembered, that the position is a kind of debatable land between the country of the Chaab and the Government of Bushire; that the village has no trade, and that it is a place of pilgrimage in a small way.

The low range of hills which we were approaching in the night is there only two miles off, and from there the drinking water is procured.

March 18th.—Mounted at 7 A. M. and rode ESE. along a plain salt and sandy towards the sea, but becoming grassy towards the hills.

7-35.—Passed through a nullah with salt water in it. Direction now SSE.

9-15.—Arrived at a square enclosure or fort protecting the wells of the town of Dillum. The town itself bears SW. by S. from this.

9-45 A. M.—Encamped on a bank by the sea shore a few hundred yards South of Bunder Dillum. This bank, which is composed of loose grey stone, a mixture of silica and fragments of shells, forms the line of the shore, and the receding tide leaves a sandy flat half a mile broad.

Bunder Dillum is a very thriving little place of about 2,000 inhabitants. The centre part of the town is occupied by a large enclosure or fort, the residence of the Kedkhoda. The Southern part is filled with a fishing population, while the Northern half is full of traders.

The fishermen, using the drag-net, catch great numbers of Seyr fish. These they split and dry and send to Bussorah by sea and to the villages round on donkeys.

The traders import iron, sugar, tea, and cloth from Bushire and Koweit, and dates from Bussorah, and forward them by caravan to Behbehan; while they bring down bales of cotton, wool, ghee, and dried fruits, and forward them to the Gulf towns.

Ophthalmia is the prevailing disease. There is very little fever and no small-pox. In fact the town would be very healthy but for ophthalmia. The water from the wells is good and abundant.

The scarcity of rain, and the avarice of the Government servants demanding that revenue which would be willingly given in a prosperous

season, have caused great discontent all down the coast from here to Rohillah. Some of the cultivators have fled the country, while others have turned marauders, creating disturbances everywhere.

March 19th.—Mounted at 6-15 A. M. and rode SE. by a well-beaten track through a barren sandy plain impregnated with salt.

At 7-4 the ground suddenly rose a little, and the character of the plain entirely changed. It became covered with grass. Here a road ran off SE. by E. towards the base of the remarkable hill, where we could see a circle of villages and a few date trees. Our direction now changed to SSE.

At 7-50 we passed through a few patches of cultivation and within three quarters of a mile of the village of Boheerat. One mile further on we forded a large and deep nullah, and still passing through cultivation.

At 9 A. M. we came to the village of Leeletœ. This consists of about six brick-built houses with a few trees. The corn here is very much in want of rain, it is short and thin and just coming into ear.

On nearing Kellah Hussar the plain became broken with small mounds, some of light grey sandstone and others covered with grass; and in the hollows there were small fields of barley. Here we saw many herds of gazelle and a few quail.

10-30 A. M. arrived at Kellah Hussar.

This is a simple square of four mud walls enclosing a few huts, and on a mound close by is an Imam with a small dome.

There are four wells of good water about one hundred yards West of the enclosure.

We had intended halting here for the day, but as there had been fighting near, and disturbances at the place, and as the Kedkhoda was abroad, the Resident deemed it advisable to push on.

10-45.—Mounted again, direction still SSE. Immediately South of the fort we forded a large deep nullah with salt-water in it, and now the style of country became quite altered. On either hand running in the same direction in which we rode was a range of sandstone about one hundred and fifty feet high, and enclosing a long basin of alluvial deposit about two miles wide. Our road lay through this basin.

At 11 A. M. we passed an attempt at a garden with a few date and fig trees and one well. The cultivation here ceased. About one mile

to our right was Imam Hassan, with a very white dome and two date trees, but the sandstone range intervened between us and it.

Many small nullahs crossed this basin; there was a little brushwood, and a little grass, and one or two flocks of sheep. At 11-20 we passed a ridge of sandstone just cropping out and running nearly East and West. It was redder than the surrounding ranges.

At 11-30 we passed a peculiar rock. A cone stuck on a cube. The whole was on a detached mass of stone about sixty feet high.

And now we descended towards the sea between irregular sandstone cliffs, red at the base but grey towards the top, by a road which was very difficult for our baggage animals. Here we met families of men, women, and children, with sheep and donkeys laden with household kit moving North to Hassar.

They told us that they belong to Kellah Hussar, but that ten days ago the Eliant horsemen came down upon them from the regions of Behbehan, and they fled to Baugh. They were now returning.

Here our road lay amongst masses of rock. It looked as if a great torrent had swept through the place, undermining some of the rocks entirely, so that they had fallen down and broken into cubes, while others had been hollowed out along one side only, and falling down obliquely, looked like the roofs of great houses.

At 12-7 we found a horizontal stratum of gypsum, about half a foot thick, appearing from under the sandstone on a level with the road, and about fifty yards further on plates of the same mineral, a quarter of an inch thick, turned edgeways and crossing the road. The plates were from one to six feet apart, and we crossed them for three or four hundred yards, when we came on gypsum in another form—plates white, crystalline, opaque, and about one inch thick. Those took the same direction as the thinner plates, and became intermingled with them, and thus continued till 12-27, when the character of the country changed, and the sandstone became mouse-coloured. The whole now looked like the debris of a gigantic quarry well washed down by rain and glistening with fragments of gypsum. At 12-45 the country became more open, and we again saw the sea, and now we entered a second basin about two miles broad, with some grass, brushwood, and patches of cultivation for the first half, but the remainder bare and salt, with here a small creek from the sea and there a nullah from the hills.

1-20.—Arrived at the well of Baugh. This is a single well of good water on the roadside in a line between a small Imam on the SW. and the highest point of Cape Baugh NE. The well appears very old and the water is more then thirty feet from the surface.

Cape Baugh is a very remarkable scarped cliff, slate colour and red alternating, fluted up and down with horizontal marks along it.

The second basin ceased half a mile beyond the well and the ground again became rocky.

From this till 3 P. M. the range of rocks still remained on our right, now approaching so as to render the ground very broken, and now retiring so as to leave open spaces with a little grass and brushwood, and here and there small fields of stunted barley.

3 P. M.—The range of sandstone on our right now stretched East, and we passed through it, and at 3-30 got into an open country intersected by nullahs with the sea on our right and the village of Khilah Khaid Hyder in front of us.

4-35.—Arrived at Khilah Khaid Hyder.

This consists of twelve huts, and is situated on a bay with a sandy shore. It is the most Northerly village in the districts of Gonawah.

March 20th.—Mounted at 5-15 A. M. and rode SE. ¼ E.

At 5-25 we rounded the head of a Khore and followed its bank for a quarter of mile near to where it opened into the sea. The ground was open, but broken by rocks, with grass and a few patches of cultivation.

At 5-50 we rode over a plain covered with fields of wheat and barley, and to our right some gardens with date trees.

At 6-10 we saw to our right a small village called Ba-Koola. It was situated on a sandy grassy mound.

Near this we found two Imams in ruins, some graves placed nearly East and West, and two banyan trees. One of these Imams was entirely in ruins; of the other, half of a pear-shaped dome and three small Gothic arches remained. The larger banyan tree was about three feet in diameter. Both had attempted to spread, but the roots had been cut before they reached the ground.

A few hundred yards South of this was a small village and a little farther on another, both apparently without names, and said to belong to

the Gonawah district. SE. by S. and about two miles from the ruined Imams we found another, called Imam Zein-el-Abedeen, apparently recently built, but near it was another banyan tree.

Here were small gardens and a sprinkling of fig, Nebbuck, and castor-oil trees.

The ground to the West of this was covered with mounds, the ruins of the city of Ghiramth or Ghirampta. Here we could trace the foundations of buildings of a bazaar, a hummum, and a caravanserai; but it may be doubted whether those were not the remains of a more recent town, as they were all placed together and very much more distinct than any thing that surrounded them.

Near this was a small round well, plastered inside, and with abundance of water. It had an antique look about it. To the South of the whole was a mound forty yards square, said to be the groundwork of a fortress.

Now the mounds extended about two miles from North to South, and about half a mile across. A large and deep nullah ran along the East side, and then along the South, and opened into the sea, so that the town must have been placed in a sack.

On examining the banks of the nullah, we found that the foundations of most of the buildings were some eight feet deep down to the sandstone, and about two feet thick.

A few fragments of vases and some bricks which seem to have been used sparingly here, were the only antiques we could find, with the exception of things made of baked clay, and said to have been thrown by slingers.

Those, or fragments of them, were found in abundance all over the mounds.

The bricks were of the same size and colour as those at Ctesephon and Asheriah.

The building stone is fossiliferous sandstone, not to be found in the neighbourhood, and said to have been brought from the isand of Karrack.

On the opposite bank of the nullah we found what might be the remains of a work protecting the ford.

Tradition has it that a river of sweet water once flowed through this nullah, and that the whole plain was irrigated from it, but now the rising tide is the only water that enters it.

Our road now lay through a plain with many cultivated fields. Two miles North of Bunder Reigh we found a range of light grey sandstone cropping out, and about half a mile from the town a ruined Imam and four banyan trees; about the same age as the others.

10-30 A. M.—Passed Bunder Reigh.

It seemed a place about half the size of Bunder Dillum.

Our direction was now SE. ¼ S., and the plain rose gradually before us. There was no cultivation till 1-20. When we arrived at Abu-Ghreb or the father of North-westers.

Here we found a number of wells of good water and some cultivation.

Our direction was now SE. by S. The plain was level and uncultivated, with many herds of gazelle, and a large nullah winding snake-like through it.

At 2-50 we crossed this nullah, and at 4-20 encamped at Rohillah on the right bank of the river.

Rohillah is a district consisting of ten villages, about two miles apart one from the other. The whole looks like a number of farm steadings with fields of thriving corn between. For here the rain has been abundant.

A large river of drinkable water winds amongst those villages, and though it might easily be made use of for irrigation, the fields are entirely dependant on rain.

Perhaps irrigation is not required, or what is more probable, the Government would immediately levy such a tax, that the cultivator would not find it repay the expense and trouble.

The inhabitants rear a number of horses, a mixed breed between the Arab and Persian, most of which find their way to the Bombay market.

The people are Arabs, and certainly the happiest we have seen since leaving the country of the Chaab.

March 21st.—Mounted at 6-40 A. M. and rode ENE. for the first half hour, then East through extensive cultivation, entirely of wheat and barley, and past some of the Rohillah villages.

7-40.—Forded the Rohillah river; here it is about one hundred yards broad, a little over the horses' girths, and running at about two miles an hour. Direction ESE.

8-40.—Passed Khurabund the last of the villages of Rohillah.

9-15.—The cultivation ceased abruptly.

A barren plain.

11-30.—Arrived at Naukar Ghize. This is a small village with a little cultivation.

1-30.—Arrived at Ahmedie on the Shiraz road.

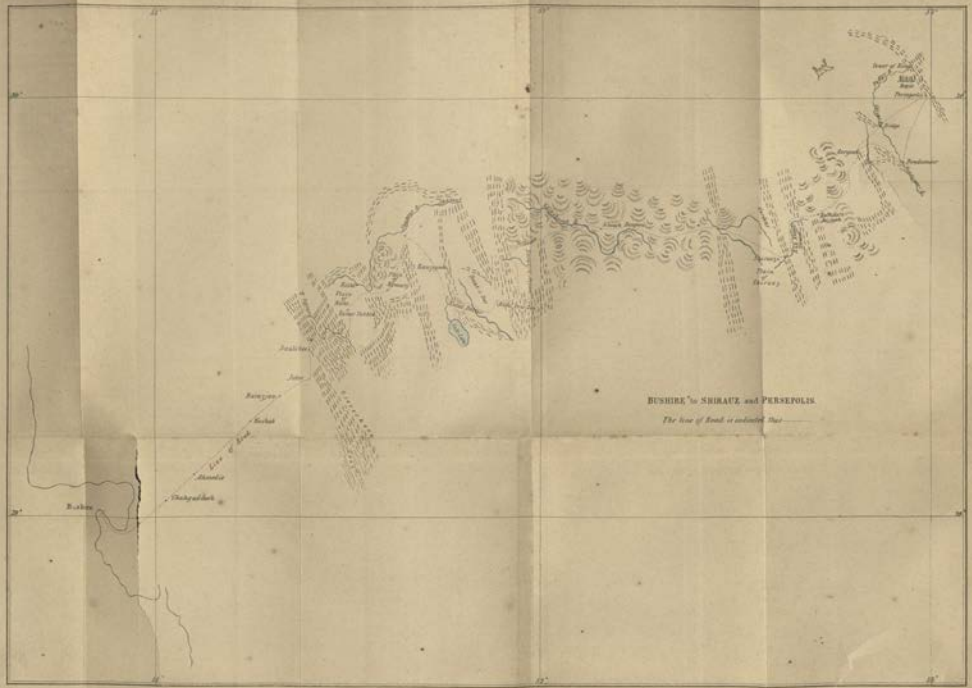
3-30.—At Chahghudduck.

March 22nd.—Sunrise, galloped with the Resident into Bushire.

(True copies)

H. L. ANDERSON,

Chief Secretary.


BUSHIRE to SHIRAUZ and PERSEPOLIS.
The line of Road is indicated thus
Bushire
Kazeroon
Kauzeroon
Kauzeroon Pass
Kauzeroon Plain
Kauzeroon Valley
Kauzeroon Valley
Kauzeroon Valley

ART. VII.—*Remarks on a recent Journey from Bushire to Shirauz, by Lieutenant Colonel* LEWIS PELLY, *Acting Political Resident, Persian Gulf. Contributed by Government.*

Read before the Society, January 21st, 1864.

No. 105A, Political Department, of 25th August 1863.

I HAVE the honour, in continuation of my letter as per margin, to submit a few remarks on my recent journey to Shirauz.

2. Appended is a tabular statement giving an approximate estimate of the trade of Shirauz.

3. Appended also is a sketch Map of our route from Bushire to Shirauz, obligingly prepared by Doctor Colvill.

4. Specimens of rock* broken off *in situ* from the ranges of hills traversing the route between the plain of Bushire and that of Persepolis are separately submitted. These specimens have been carefully collected by Doctor Colvill.

5. The country between Bushire and Shirauz may be divided into—

1*st*.—The plain stretching from the shore line of the Persian Gulf to the lowest spurs of the mountain ranges, near Barazjan and Daulekee.

2*nd*.—The succession of passes commencing at Daulekee, and leading up into the high plateaus of Persia.

6. The general aspect of the first division is that of a dead and arid flat, almost level with the water-line, fringed here and there with lines of date trees, and here and there, at wide intervals, sown with barley, wheat, melons, cucumbers, and other vegetables. Indeed, as I first looked inland towards the mountain ranges from the top of a house in Bushire, I was reminded of the plain stretching from the frontier of Upper Sind to the foot of the Bolan; and as I looked back from the mountain

* Also a Geological Memorandum on the route.

spurs near Daulekee towards the sea, the plain looked much what that from the westward of Kurrachee would look from the pass leading to Sonmeeanee if that pass were removed to four times its present distance from Kurrachee.

7. From Bushire to Daulekee the forts or villages are as per margin. The entire distance by the road may be fifty full miles, and it is remarkable, that although this is the main line of trade into Persia, and although the heat of this plain is for some months of the year so intense that people are known to fall dead in traversing it, yet there is not one caravanserai until you reach Daulekee: no stream of fresh-water is to be found anywhere. The villages are supplied from brackish wells. Drinkable water is, however, to be found at a short distance below the surface of the ground, and the people are expert in digging temporary wells. Corn and provisions, sufficient for the wants of the peasantry and for that of passing muleteers, are found at all the forts; but beyond this little reliance could be placed on provisions. The surplus corn is exported; that which remains in store is buried in pits lined with straw. These are readily discoverable by probing; and the pit coverings are generally raised into mounds.

Chaghudduk.
Ahmedee.
Esawendy.
Khooshab.
Barazjan.
Rahdari.
Daulekee.

8. The grain is sown in late autumn and reaped in late spring and early summer. Cotton thrives everywhere, but it is carelessly sown, and the same bushes are left standing for an indefinite number of years. The garden crops are dependent on wells, or on water drawn from the subterranean water-ducts, which everywhere pierce the tongue of land on which Bushire itself stands. For the rest, crops are wholly dependent on rain, which falls at intervals, and sometimes heavily from December to April. An adequate supply of rain is however very uncertain, especially towards the close of the rainy season, when it is most required. Locusts are a curse to this plain. I have passed through flights of them absolutely darkening the sky and destroying corn, dates, and all else they came across: the peasantry fry and eat these locusts.

9. Between Bushire and Chaghudduk being the first stage out, lies a salt marsh of some five miles in breadth. During the wet season it si in large part impassable; and even at this, the driest season of the year, if you leave the beaten caravan track, your horse is up to his

knees in mud. After crossing the marsh, the road lies through Chaghudduk, Ahmedee, Khooshab, to within a mile of Barazjan, along an alluvial plain. One brackish river—bed crosses the road between Chaghudduk and Ahmedee, and leads up towards the Hufmoollah Pass at Ahram through Tchahkoota.

10. Arrived at Barazjan—the road becomes stony and broken, and so continues below the lowest of the mountain spurs until you reach the vicinity of Daulekee, where it again becomes alluvial and indented by brackish streamlets. Half way between Barazjan and Daulekee, at Rahdari, a road branches off towards Nanezack, and leads up to the heights of Gisakoon. Dr. Colvill ascended to these points, and found them to have a small fort, running water, and a climate superior to that of Khisht or even of Kauzeroon, but inferior to that of the plains beyond the Kutali Peer-i-Zen—inferior therefore to that of Shirauz. The road up to Gisakoon is precipitous and bowlder-strewn. The so-called coal bed on the Gisakoon Hills is not favourably reported of. It is possible, however, that at some depth coal may be findable.

11. All the villages, even Barazjan included, from Bushire to the base of the hills, may be described as a series of simple forts of unburnt brick or rough stone, surrounded by straggling collections of temporary huts. Here and there a wealthier farmer may have built a mud-brick house, whose upper room peers drearily over the general huttage.

12. I found all the Khans of the villages communicative and very civil, although among themselves they are at nearly perennial feud.

13. I append, although I am not sure it is worthy the Government perusal, a memorandum of all the tribes located below the passes in the neighbourhood of Bushire.

14. Leaving Daulekee, you at once ascend into the second division of the route, and I may remark, in passing that I found Mr. Claudius Rich's Journal of his journey along this road in the year 1821 to be so faithful and clearly put, that any remarks I could make on the line could contain litile that is new. Mr. Rich however gives all his distances by the time occupied in the march. He travelled during moonlight nights and on a fast mule; some allowance should be made accordingly.

15. Perhaps the most arduous stage along the entire route is that from Daulekee to the plain of Khisht, being a distance of 16 heavy miles. There is no road properly so called. A succession of mule

caravans passing for an unknown succession of years have worked the rock into foot-holes, and the bowlder-strewn parts into a marked line. It is astonishing how the trade of a country faces such a route. A fursac from Daulekee—after traversing that is the lowest hill-range—you reach a drinkable spring at the head of a long, narrow pass, which winds down to the next valley, along which falls the Daulekee river. The water of this river is undrinkably brackish. One of my followers who bathed in it during a hot march was seized with a raving thirst. A bridge which once crossed this impetuous flood was carried away, and has not been replaced. You have now to cross the stream three several times, and in winter or in spring caravans are sometimes delayed many days on its banks, and it is reported that many packages and some mules are annually lost in the flood while crossing. Having crossed this river, the track lies for a fursac along its banks, gradually leaving it and winding up to a steep kutal or precipitous pass, on the summit of which rests the Khisht plain.

16. The kutals along this line are (with the exception of that of the Kutal-i-Dokhtar) all of one description. Take a corkscrew, stamp it into a steeply inclined plain, and you have a kutal. It is, in fact, the track which mules and rain have scoured in a zigzag down the face of a precipitous hillside: this kutal would be impracticable for mounted guns. No water is findable along this stage after leaving the spring above noticed.

17. Khisht may be described as a plain of an irregular oval, some ten miles in length, five broad, and surrounded by hills, unless at the point where it overlooks the brink of the kutal already described. A river which winds down through the hills past the old ruins of Shapour, and which bears that name (Shapour), enters the Khisht plain in a fine and drinkable stream on its Eastern side, and keeping close below the hills, which skirt the plain on its Eastern and Northern sides, passes below the town and fort of Khisht, and finally descends to the Gulf far to the Northward, on the Brihbahoon and Shushter line.

18. Numerous water-ducts have been cut across the plain leading from the river-bed, and this portion of the plain is well cultivated with wheat, barley, rice, tobacco, and cotton; it contains also extensive date groves: perhaps upwards of 20,000 date trees may be found. The plain is further dotted with old stumps of trees and brushwood. In the

centre of the plain, and on the high road, is the group of hamlets called Konar Thakhta, lying around a commodious and solid masonry caravanserai. Distant a mile and a-half North-west from Konar Thakhta is found the best well water.

19. There are some 31 villages or hamlets subordinate to Khisht considered as a revenue division. The list as per margin shows their names and their distance and directions from the fort of Khisht. These villages may contain from 100 to 200 inhabitants each, dwelling in from 30 to 60 temporary huts. The produce of the country not required for home consumption is either consumed by passing caravans, or is exported to Kauzeroon and Bushire. The imports are piece goods, sugar, and coffee for home use. The revenue, amounting to about 7,000 tomans, is levied in the lumps. The safety of road traffic is provided for by the chief of the district, who maintains some 50 irregular footmen for the purpose. The chief is responsible for all goods lost or plundered from caravans within his district, and charges a sort of transit due of 25 cents of a kran on every load of piece goods, and 12½ cents on every load of miscellaneous merchandize. The management of Khisht may serve as a sample for that of other districts.

On the North of Khisht.

Mohleddeen	½ fursac.
Aykoony	1½ ,,
Booreky	½ ,,
Khajemaly	1½ ,,
Bozeen	1½ ,,
Gooreekel	¼ ,,

On the East.

Kemarij	3 fursacs.
Banoo	3 ,,
Roodak	3 ,,
Movrizy	5 ,,
Siahmenseer	6 ,,
Shool	6 ,,
Jemila	8 ,,
2 Boorekies.	¾ ,,

On the West.

Malesheekh	8 fursacs.
Dashtegoor	7 ,,
Sardashtak	8 ,,
Siahmenseer	6 ,,
Khoonesorkh	6 ,,
Shool	5 ,,
Jereh	6 ,,
Meylak	6 ,,
Chashistany	1 ,,
Borjekan Bauker	1 ,,
Borje Kayid Mahomed Tuky	½ ,,
Boorekies	½ ,,

20. I estimate the altitude of the Khisht plain to be about 800 to 1,000 feet above the level of the Gulf, and I find some confirmation of this estimate, in the fact that the bluff marked on the chart as Gisakoon, and which on its two sides is distinctly visible from Khisht or from Bushire, appears to rise certainly within 800 feet as high above the Khisht plain as above that of Bushire.

21. I passed two days in the serai during July and two days in the early portion of September; during both periods a fiercely hot wind

blew all day. In July the thermometer was at 96° early in the morning, and about 110° during the heat of the day; in short, the place reminded me much of Sukker in the hot weather, but with this marked difference, that the temperature during the night at Khisht is much cooler, and the hot season is not of nearly the same duration.

22. Quitting the Khisht plain, you pass over a low range, and again descend upon the Shapour river, skirt it for a mile, and leave it on your left, winding up a long ravine, which has one sweet, but scant spring, to the base of a second steep kutal. The sides of this ravine, as of the hills in general, seem in a state of decay. This second kutal is not so high, but is quite as steep and as impracticable for carriages as the first. Arrived at the top of the precipice, the track again lies along an ascending bowlder-strewn ravine, until you reach the plain and half ruined serai of Kemarij. This serai may be eleven heavy miles from that of Khisht. Water and supplies at Kemarij are scant, and the water very brackish. There is indeed but one passable well. Caravans avoid this station for halting. Its air, however, though hot, seems to me preferable to that of Khisht.

23. Leaving Kemarij the road runs the length of the plain about one fursac, then enters a long and difficult defile with precipitous rocky sides. The pass through these rocks is as darksome and dreary as if to the region of shadows it carried. But enter! a sweet laughing valley is here, where the spring with the autumn is married. Emerging you come again on the Shapour river, and can trace its course to the cleft in the hills, where the ancient fort and rock sculptures of Sapor and the Emperor Valerian are still visible.

24. Leaving the river on your left, and treading Eastward, you open the Kauzeroon plain, pass through a ruinous village with good water, named Dirriz, and thence after two fursacs, reach the town of Kauzeroon. The entire distance from Kemarij to Kauzeroon may be 17 miles, or rather more. The road to Shapour branches off to Dirriz.

25. Kauzeroon is the principal town and a sort of half-way point between Bushire and Shirauz. It may contain about 3,000 inhabitants, and is he head quarters of the muleteers. Drinkable water is sufficiently abundant, and the surrounding plain tolerably cultivated. In the suburbs of the town are three or four fine gardens or groves of

oranges, pomegranates, and other fruits, also a few date trees. The date, however, does not ripen well at Kauzeroon, and I saw no date tree after ascending above this plain. Unless for the gardens above noticed, the plain of Kauzeroon is not well wooded. Firewood in any quantity would have to be collected at considerable trouble from the neighbouring hills. The town of Kauzeroon is built of stone in irregular narrow streets, and nearly wall-less. Tradition asserts of this as of almost every other town of Persia I have visited, that it is falling off, that matters once went much better with it, that its decline is due to Governmental tyranny, and that the people are at the last grip of poverty. I find, however, that the revenue now paid is that which has long been paid, and that the population has long been what it now is, and I judge that when Shapour in the adjacent valley was deserted, the want of a half-way house between Shirauz and the Gulf was felt, that the plain of Kauzeroon offered a convenient point, as being directly on the high road, whereas Shapour was at a distance from it; and that the town of Kauzeroon thus rose, and its plain became cultivated, until it fulfilled the requirements of its passing traffic, and produced sufficient for the home wants and small exports of its own inhabitants. The district of Kauzeroon pays a lump revenue of some 25,000 tomans. Next to Shirauz it is the greatest rendezvous of mules along the route. The mules are usually bred among the Eliant tribes, who bring them for sale when one or more years of age. The Eliants further rear good serviceable horses. In the province of Fars the horse of most esteemed breed is that of the Kashgai tribe. It is of Arab descent, but being reared among rocky mountains, acquires an activity and sure footedness over stony ground, which are rarely found among Arab horses brought from Arabia. I am of opinion, that a large supply of serviceable horses might be obtained from the province of Fars as from other Persian provinces. I observed the Eliants frequently passing mounted on good brood mares, with colts running alongside; and in the plain of Persepolis for instance, I saw numerous mares loose, out feeding in the neighbourhood of the Eliant tents. I was assured that they could readily collect for me some 500 horses in that plain and its adjacent hills. I was often asked as to the prospects of the Bombay horse market. All seemed to well understand its fluctuations, and it was interesting to watch the rapid and sensitive manner in which supply and price seemed to respond to anything like a demand.

26. Fruit and supplies, whether of grain or meat, can be procured at Kauzeroon in good quantity, but these could not be depended on by a force entering Persia, unless the tribes were for you. Frozen snow is collected in the mountains rising behind the town of Kauzeroon on its North-eastern side, and is brought down during the summer for use in the town. With care this snow can be taken to Bushire on a relay of mules even during the hottest months, but it keeps only a few hours after arrival.

27. As illustrative of revenue management in Persia, I may mention that during a week or more I passed in a garden immediately without the town, a small civil war was going on between the Governor and his followers on the one side, and certain other tribesmen or factionists on the other. Fights daily took place, and at length the Governor had to conceal himself. When I left he was still hid and unable to receive my return visit. The strife resulted on oppressive revenue demands. It happened there was a change of Governors taking place, the one newly appointed had not arrived from Shirauz. Meantime none of the corn long reaped and stacked could be housed, because no division of the crop could take place. Meantime also, the old Governor was endeavouring to collect all he could of old debts, hence the uproar. I noticed too, that the youths of the town, following the example of their elders, turned out to the number of fifty or so, and had a battle royal with slings and stones.

28. Before quitting the neighbourhood of Kauzeroon, I paid a passing visit to the ruins and rock sculptures of Shapour. This old site seems to have been excellently chosen. Scarped and lofty rocks look down on a chasm of some 400 yards in width, through which pours a fresh and copious stream, from a superior and bright little valley enclosed with precipitous hills. The scarp on the right of the chasm as you enter bears the traces of the old fort of Shapour, and at the foot of this scarp, close on the roadway, is the famous sculpture of the captive Emperor Valerian at the stirrup of Shapour. The cutting is fresh and bold; to my notion far superior, in an artistic point of view, to any sculpture at the Nakshi Rustum near Persepolis.

29. On the other side of the chasm are a series of rock sculptures illustrative of historical or poetic subjects, and some of them in point of execution almost equal to the Valerian.

30. I went up the inner valley skirting the stream, which fresh, rapid, and embowered in willows, is one of the most romantic I have seen in Persia (this however is not saying much); you could not cross a common valley in England without coming on as good or pretty a one—

> Where lawns extend that scorn Arcadian pride,
> And brighter streams than famed Hydaspes glide,

until I reached the base of the cliff, in which is the entrance to the vast cavern, at whose mouth is the famous but fallen statue of Shapour. This figure, which is of colossal size, and is traditioned to have fallen from its pedestal during an earthquake, now lies here buried close by the pedestal, the head gone, but the torso of bold and artistic form. Some of our Orientalists had cut their names on the shoulder. Immediately behind the statue, the cavern expands into a vast and lofty natural dome; then bifurcates, one fork coming to an end after some 50 yards, the other and larger fork winding downward and on, here and there ornamented with stalactites, until you reach an ice-cold lake or pond. I am not aware that this cavern has ever been explored to its inmost depths, and superstition as usual assigns to this Hades those marvels and horrors which so readily define the unknown.

31. While on this visit to Shapour, the chiefs of the villages through which I passed insisted on turning out with some of their irregular horse and foot and escorting me. I permitted the compliment, as it afforded me a good opportunity of seeing the men work, and I was certainly struck by the quick and skilful manner in which they occupied ground, kept themselves covered, and observed the neighbourhood. Their fire was good, and they were practised in firing in every position, many even lying on their backs and firing with some nicety backwards by an upward glance. Each village troop seemed to keep apart, and to observe courtesy towards the others. On the whole, these men seemed to me formidable as irregulars among their own hills.

32. Leaving Kauzeroon and moving onward for Shiraüz, you pass Eastward along the Kauzeroon plain for above seven miles, when you come on a shallow fresh water river running into a salt-lake. The river forms a sort of half marsh before entering the lake, and is crossed by a long, rough stone causeway.

33. A little before reaching the causeway, the road branches off in a Southerly direction, and passing through the villages as per margin, joins the Southern or Ferozeabad or Eliant road from Shirauz to Bushire. It may be illustrative of the difficulty of arriving at the truth of any statement in Persia, to allude to the following circumstances relative to the transport of the artillery of the Persian army during our late expedition to the Gulf. We always understood at Bushire that the Persian army came down to Barazjan by two routes, viz. the main body by the Kauzeroon route, and the guns, protected by some Eliant cavalry, by the Ferozeabad route, debouching at Nanezack, and this for the reason that the Kauzeroon route was impracticable for guns. On reaching Shirauz this time, I learned from a reliable European authority, that he saw the guns going down the Kutal-i-Pirizen and Kutal-i-Dokhtar, often with one wheel over the precipice, and supported with ropes by main force. The two statements were at length reconciled. The guns went down the usual route as far as Kauzeroon plain; but then, finding that the lower kutals were impracticable, turned off by the cross-road now alluded to, and so got into the less precipitous route of Ferozeabad, and debouching at Nanezack.

Revantak.
Gureh.
Novjen.
Auviz.
Ferashband.
Boshkaun.
Keleme.
Haftmoolleh.
Nanezack.

34. After passing the causeway, the main road winds gradually up a valley for some three miles to the foot of the Kutal-i-Dokhtar. This kutal is the only one along the line which has been artificially prepared: it was roughly paved and parapetted by the generosity of a merchant. Looking back, the view of the Kauzeroon plain is fine and extensive, and immediately below you lies the lake, set like a deep sapphire in the bosom of the hills.

35. Arrived at the summit of the kutal, the road slopes slowly across some cultivated ground, down a long valley covered with dwarf oaks (Dushi Bur), and stretching to the base of the Kutal-i-Pirizen. This valley has no water, but a village lies about three miles to your left on entering the valley, where both good water and some supplies and fruit are procurable.

36. The Kutal-i-Pirizen is the longest and perhaps the most tiring of all the passes, but the stage out of Kauzeroon, and distant from the

latter place about 18 miles, or rather more, is half way up the Pass, where there is a new and substantial caravanserai, enjoying fine air, commanding an extensive view of the country, and supplied from an abundant and excellent spring of water close at hand. There is, however, no village near, nor are any supplies obtainable, unless a little straw, &c. for the mules, from a man who, as usual, maintains himself at the serai door by the sale of such supplies to caravans.

37. This caravanserai, known as Meoon-kutal, is, in my opinion, the first point you arrive at where the climate can be considered such as would suit the European during the hot season. From this pass onwards the hills also become more thickly wooded, and the trees—the wild fig, wild cherry, and other wild fruit and miscellaneous trees—though still what in favoured countries would be considered of stunted and parched appearance, are of larger growth than those on the lower ranges.

38. From the serai, the next stage lies up the remainder of the pass to what is perhaps the highest point along the entire route, and thence, over some wooded undulating ground, and down a bowlder-strewn steep, into the valley of Dusht-i-Arjan. This valley or plain is remarkable for its ample supply of water, for its verdure, and for it being a favourite haunt of the Eliants during the warm season. Like many of its fellow valleys, Dusht-i-Arjan bears the appearance of having once formed a lake. Much of it is still in swamp, watered from a copious and sweet spring, which wells up at the base of a precipitous rock, and passing under the grateful shade of a few large willow and palm trees, at once becomes a broad sparkling stream. As an instance of the variations of temperature experienced along this line, I may mention that the thermometer which at Konar-Thakhta we left at 110° sunk just before sunrise in Dusht-i-Arjan to 47°. The fall during the last ten minutes was 10°. My native followers began to feel the effects of fever in this plain, and continued to sicken until we returned from Shirauz. One real inconvenience in this valley is its mosquitoes, which are the most numerous and most venomous I have anywhere found. It was, indeed, impossible to sleep for them. A small village lies within a few hundreds of yards of the group of trees above noticed, and which forms the pleasantest halting ground. Mares, cows, and flocks may be seen feeding in considerable numbers so long as the Eliants are in the plain. Grass would be abundant in the spring. The plain may

have a length of five by a breadth of two and a-half or three miles. We found the Eliant milk and butter excellent. The distance from the Meoon serai to the halting place in Dusht-i-Arjan may be 10 or 11 hilly miles.

39. Leaving Dusht-i-Arjan you ascend by a comparatively easy slope over some highlands still well sprinkled with trees, and after six miles come steeply down on the River Karaghach. In this, the driest season, it has still a depth of a foot or so of water in a broadish stream, and winds away South towards Ferozeabad. After crossing this valley, you come on the fine open downs of Khoneh-i-Zuneeoon, in my opinion the healthiest camping ground along the entire road. It is some hundreds of feet higher than the Shirauz valley, open, well-watered, with a caravanserai and patches of cultivation. This serai may be 10 miles from the Dusht-i-Arjan station, and is at least 27 miles from Shirauz, whither you pass over rolling highlands, but always descending somewhat until you open the Shirauz plain, more and more frequently darkened on its further limits by the orchards and gardens forming the suburbs of Shirauz itself.

40. This town is the capital of the province of Fars. It may contain from 30 to 40 thousand inhabitants. Its walls are nearly in ruins; its bazars are good, arched, and sufficiently wide. They reminded me of the more modern bazars of Tehran. The finest bazar and the finest and most durable of all the buildings in and about Shirauz were built by the celebrated Kerim Khan, himself originally an Eliant, afterwards Lord of Fars, and indeed of Persia. The proverb goes, that the earthquakes always spare what Kerim Khan erected. As to the suburbs of Shirauz, I have not seen any town in Persia whose gardens appeared to me so numerous, extensive, and luxuriant.

41. The province is governed by the king's eldest son. He is not however (Wah-ahed) heir apparent. It seems four considerations are entered into in determining who among the king's sons shall succeed—

1*st*.—That the mother be of the royal tribe Kujjur.

2*nd*.—Priority in age.

3*rd*.—No physical defect of a nature to incapacitate for reigning.

4*th*.—The will of the reigning Shah.

42. The mother of the Prince Governor was not of the royal tribe. Again, although Prince Governor, it does not follow that he is Firman-

firma. Among all recent Governors General of Fars only one received the title Firman-firma. It is probable the present prince will receive it, as being the Shah's eldest son; but it does not follow of necessity that he should do so.

43. The prince being only 14 years of age, much of the real responsibility of government devolves on his deputy, the Zaheer-ood-Dowleh, who was Master of the Ceremonies at Court when I was in the Legation. Both personages received me with those marks of ceremony and graciousness which perhaps no court better understands how to observe than that of Persia.

44. I do not regard Shirauz as a mercantile town, properly so called. It is rather a convenient central point of agency, and the centre of an agricultural district. The large majority of the population are agricultural, or connected therewith. There are scarce any principals of firms, but some agents who receive goods coming to and from Bushire, Lingah, and Bunder Abbass, and transmit them whether to Ispahan, Tehran, Yezd, Kerman, or elsewhere.

45. From Shirauz to Bunder Abbass through Lar may be 25 days caravan route, viz. 10 to Lar and 15 days on. Lar is the point where the road diverges down a bad route to Lingah, which may be 10 days arduous caravan journey. The road from Shirauz to Kerman may be 10 to 12 days' caravan journey, but the trade to Kerman, as also to Yezd, is mainly from Bunder Abbass, a comparatively trifling portion reaching those places from Bushire *viâ* Shirauz.

46. The general opinion at Shirauz seemed to be, that the trade passing through Abbass is greater than that passing through Bushire, but that the consumption of Bushire and its neighbourhood being larger than that of Abbass, Bushire is the better known port. Supplies are obtainable along the Abbass road so far as Lar: from thence onwards you must carry your own provender, and even water.

47. I append a memorandum drawn up by an old Mirza at Shirauz on the Province of Fars in general. It is probably as reliable as any document one could obtain from a Persian who has had 60 or 70 years' opportunity of observing the details of the country he summarises. By Fars however must be understood the province of Fars in its largest extent, reaching from Bunder Abbass on the South to within a few stages of Ispahan on the North, to near Kerman on the East, and to

the Gulf line, embracing Lingah and Bushire and the Beihbahoon and Shuster lines, on the West. A patriotic Persian of the conservative school understands by Persia the four great provinces of—

1*st.*—Khorassan (or the rising of the sun), extending from the South-east of the Caspian to the Indus Valley.

2*nd.*—Azerbaijan (for Assur-baijan the setting of the sun) containing Media, Atrapatene, and the country bordering on Armenia and the Caucasus.

3*rd.*—Irack, or the great central province lying between the two above named provinces and extending Southwards to Fars.

4*th.*—Fars, the province already defined.

48. Each of the provinces is considered to contain six subordinate sections, so that Persia is neatly described as being composed of four provinces and twenty-four sections.*

* It were an interesting, but for me too delicate an inquiry, to analyse the causes of the present social and political condition of Persia. How comes it that this empire continues in her present poverty-stricken, corrupt, and helpless state? She lacks not antiquity of origin! The Greek was here with all that he had to say as the most highly civilised person of that epoch; the Roman was here with his laws, and it is to Rome that we owe ours. When the Arabs, under the Abbassides were the preservers of the masterpieces of Western genius, their centre of culture was Baghdad on the Persian frontier. There are remains even now throughout Persia, showing that so late as the reign of Shah Abbass some progress was made, some care was taken of the public good. Persia has still the benefit of Prince Gortschakoff's monitions, the Emperor Napoleon's ideas, and Earl Russell's diplomacy. The Persian himself is quick-witted enough, especially in rascality. If beauty of language, melody of syllables,† harmony of sense with sound, are sought, Saadi and Hafiz have them to the full, with the poets of any modern tongue, and perhaps not far behind Lucretius or Euripides. I have heard Sir Henry Rawlinson say that he has witnessed the arguments of the schools of ancient and modern metaphysics set forth with as much elegance and dialectic skill by philosophers in Persia, as they are by Plato, Zeno, or Epicurus; by Spinoza, Berkeley, or Kant. If you talk with a Persian statesman, he deplores the condition of his country, and sketches the requirements of its renovation with a pathos and acumen that would do credit to a vizier of Turkey. The Persian peasant is a man of powerful frame, docile, industrious, frugal, and temperate. Next to vanity, avarice is the most glaring national characteristic. How comes it then that Persia remains what she is?

Sir, there are causes, and these causes are discernible. If the age were only ripe for removing them, some broken outline of these causes is perhaps open; meantime,

† See note * on next page.

49. I could have wished to return from Shirauz to Bushire by the Southern or Ferozeabad route, but my followers were weakened by fever, and I did not feel justified in unnecessarily exposing them at the hottest season of the year.

50. The Southern route may however be generally described as sufficiently level and inhabited to Ferozeabad, which is the chief town of the Ilkhanee of the Eliants, as being sandy barren, in part hilly from Ferozeabad onwards to Ferashband, and thence through the Dashtee country to the Bushire plain. Low brush covers many of the tracts passed over in this latter postion of the route. As to the Eliants, it is stated the Ilkhanee can place from 10 to 12 thousand men in the field. He has, in fact, power over all the tribes in this part of Persia. His election is dependent on the will of the Shah. He lives at Shirauz, pays certain sums annually to the Government, and is sent

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I would respectfully hint one prominent physical cause, want of rain and rivers, consequent aridity over vast extent of country, and separation of the masses into small communities in distant isolated valleys. Permit me to suggest, that when your telegraph for messages is finished, an electric apparatus for the beneficial distribution of spare rain over Central Asia would be a useful political measure. If they could only bring rain to their lands, and their women into society, sensible Persians might have some hope for "poor Iran."

* I observe in a note, page 140, of the *Edinburgh Review* for last July, that the late Sir J. C. Lewis is asserted to have said, that the Orientals "have never produced any scientific or literary work worthy of mention, except the "Arabian Nights." Yet Job and the other books of the Old Testament are generally admitted to have some merit; the Fables of Pilpai, dressed by Æsop, have some fame. There are passages in the Sacontala which some critics have held not very inferior to the Antigone of Sophocles. I will be bound to say, there is not at the present day a single opera or tragedy in Europe that produces one-half the effect upon the audience that the tragedy of Hussun Hoossun produces upon a Persian audience. The reviewer, however, prudently premises that Sir C. Lewis "was not himself an Oriental scholar."

When I was at Shirauz the other day, I heard a celebrated singer (a Dervish) sing and accompany himself with wonderful mastery on his guitar. The songs of Persia are almost innumerable. The dervish seems to know an indefinite number. His practice, I believe, is to sing on till he gets drunk.

I heard also a lad with a fine tenor, almost soprano, voice chant favourite parts from the Shahnameh of Ferdusi. He commenced every line in a high note, swelled out towards the middle of the verse, and gradually died away to the close in a long and plaintive thrill. When he began we were in the middle of a convivial and

for to the capital and made responsible in the contingency of the tribes incurring the displeasure of the Government.

51. It should not however be supposed that the Eliants are all describable under one class. The tribes vary in riches and stationariness: some being wretchedly poor, filthy, and widely wandering: others again enjoying fine camping grounds, and all the comfort of patriarchal wealth. You ask them while passing, who are you? Arabs, Turks, Ajmi. Many speak a sort of Turki, many a mongrel Arabic, and most of them a mixture of modern Persian, and their own dialect interspersed with old Persian, and with some words that seem to be identical with words still in use among the peasantry of the Deccan.

52. Being at Shirauz, I naturally made a flying visit to Persepolis (Thakhti-Jamsheed) and to the neighbouring rock sculptures of Nakshi Rustum and Rejib, but these scenes, in part more beautiful and more impressive than aught else I have seen in the East, do not belong to the subject of this report. How old are those chedder-looking cliffs, on whose faces the sculptured tombs of ancient kings show like scratches of yesterday? Look at those names of a British Embassy carved in the nineteenth century of our Lord on the same block with that dead and lost language! Who reared those enormous slabs which the fanatic Omar disfigured and hurled down.

53. What architect, and whence, designed these Indianic Halls beside which yon fluted columns soar Greekly modern? Could not the greatest philosopher, critic, statesman, savan of all antiquity—could

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rather noisy party, and some of the guests were in the ecstacies of a Persian dance, yet speedily all was silence; all had gathered round the lad; all was intense attention! I seemed for the first time to realise Homer, and how and with what effect he or other bards chanted the national traditions and ballads to a Greek crowd. In Bushire there is a man who daily in the afternoon takes his high arm-chair out and places it against the wall of a terraced tea and coffee shop. Women come and sit like crows immediately above along the edge of the flat roof, and male auditors crowd round and squat in the street below. Then he commences his recitative in a loud and authoritative voice. All sit rapt in interest, and will so sit for hours scarcely moving a limb. Surely one should in part judge a literary or poetical work by the effect it produces on the nation in general to which it was addressed; and perhaps no poet in any country in the world has ever become a National Poet unless there was a strong thread of common sense running through the web and woof of all his work, and coming home with more or less beauty of expression to the heart as well of the peasant as the prince.

not the Stagirite leave on the genius of his pupil Alexander lessons which should save him from burning a vanquished city to please a courtezan? Was this banquetting hall, its windows inscribed with cuneiform, its portals relieved with winged beasts—was this the scene of the hero's revel? Where sat he drunk with Lais to watch destruction with the delight of a fiend or a conqueror? Where is our progress? The Eliant spreads his tents among the ruins of Persepolis!

54. Such reflections rise in spontaneous confusion while looking on these dead remains. We come, we gaze, we go away; not wiser, but perhaps a shade more sad! We leave them in their beauty and their solitude: hallowed by time, misfortune, and mystery!

I have the honour to be, &c.

LEWIS PELLY, Lieut. Colonel,
Acting Political Resident and
Consul General Persian Gulf.

Average of Merchandize Annually Imported

Names of Places.	Sugar, Indian.	Sugar Candy.	Sugar, Loaf.	Sugar, refined, English.	Pepper.	Ginger.
	T. M.	T. M.	Boxes.	T. M.	T. M.	T. M.
From Bombay and Bushire	700,000	5,000	200	8,000	30,000	6,000
,, Ispahan	....	..	..	..	..	..
,, Yezd	....	..	..	..	..	..
,, Cashan	....	..	..	..	..	..
,, Tehran	....	..	..	..	..	..
,, Khorassan	....	..	..	..	..	..
,, Tabreez	....	..	..	..	..	..
,, Khisht and Kauzeroon.....	....	..	..	..	..	..
,, Jahroom.....	....	..	..	..	..	..
,, Neeriz	....	..	..	..	..	..
,, Lar	....	..	..	..	..	..
,, Kerman	....	..	..	..	..	..
,, Bavanat.....	....	..	..	..	..	..
,, Beihbahoon	....	..	..	..	..	..
Total....	700,000	5,000	200	8,000	30,000	6,000

Average of Merchandize Annually Exported

To Bushire and Bombay	....	..	..	..	..	..
,, Ispahan	300.000	3,000	50	4,000	15,000	3,000
,, Yezd	200,000	500	..	2,000	10,000	1,500
,, Cashan	100,000	500	..	1,000	3,000	1,000
,, Khorassan	....	..	..	..	..	..
,, Tabreez	....	..	..	..	..	..
,, Kauzeroon and Khisht	....	..	..	..	..	..
,, Jahroom	....	..	..	..	..	..
,, Neeriz	....	..	..	..	..	..
,, Lar.....	....	..	..	..	..	..
,, Bavanat	....	..	..	..	..	..
,, Beihbahoon.....	....	..	..	..	..	..
Total....	600,000	4,000	50	7,000	28,000	5,500

*** One Shirauz or Tabreez Maund is 7¾ lbs.
One Load is 40 Maunds.
Boxes vary in weight: that of Indigo is 20 T. M.; of Sugar 24 T. M.; of Tea 8 or 10 T. M.; and that of Shawls each contain 100 pieces.
One Carboy is a vessel that holds about 12 quarts.
One Toman is about 10 Krans, or Rupees 4-12-0.

into Shirauz from different places.

Cinnamon.	Turmeric.	Khosrowdar.	Cardamums.	Tea, different qualities.	Cloves.	Ammonia.	Gold Leaf.	Sorenj.	China Root(Sarsaparilla).	Sefidubokal.
T.M.	T. M.	T. M	T. M.	Boxes.	T. M.	T. M.	Bundles.	T. M.	T. M.	T. M.
1,500	15,000	1,000	600	2,000	400	1,000	1,000	100	300	300
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
1,500	15,000	1,000	600	2,000	400	1,000	1,000	100	300	300

from Shirauz to different places.

..	....	..	..	..	..	..	....	..	..	..
500	8,000	500	200	1,000	100	500	500	30	50	150
500	3,000	250	100	300	100	250	250	30	80	50
200	1,000	100	100	200	50	100	50	20	50	20
..	....	..	..	..	..	..	....	..	..	..
100	....	..	100	200	50	100	....	..	100	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
..	....	..	..	..	..	..	....	..	..	..
1,300	12,000	850	500	1,700	300	950	800	80	280	220

All the articles marked with an asterisk (*) are the produce of the Country.

Average of Merchandize Annually Imported

Names of Places.	Crockery.	Glassware.	Iron.	Iron wire.	Copper.	Tin.
	Boxes.	Boxes.	T. M.	T. M.	T. M.	T. M.
From Bombay and Bushire	500	50	78,000	3,000	50,000	12,000
,, Ispahan	..	..	..	..	....	..
,, Yezd	..	..	..	..	500	..
,, Cashan	..	..	..	..	600	..
,, Tehran	..	50	..	..	....	..
,, Khorassan	..	..	..	..	....	..
,, Tabreez	..	..	..	..	....	..
,, Khisht and Kauzeroon....	..	..	..	..	....	..
,, Jahroom	..	..	..	..	....	..
,, Neeriz	..	..	..	..	1,000	..
,, Lar	..	..	..	..	....	..
,, Kerman	..	..	..	..	....	..
,, Bavanat	..	..	..	..	....	..
,, Beihbahoon.....	..	..	..	..	....	..
Total....	500	100	78,000	3,000	52,100	12,000

Average of Merchandize Annually Exported

To Bushire and Bombay	..	..	..	..	....	..
,, Ispahan	300	30	34,000	1,500	30,000	6,000
,, Yezd	100	10	..	..	....	..
,, Cashan	30	5	10,000	500	1,000	1,000
,, Khorassan	..	..	..	..	....	..
,, Tabreez	..	5	..	..	....	..
,, Kauzeroon and Khisht.....	..	..	..	..	1,000	..
,, Jahroom	..	..	..	..	1,500	..
,, Neeriz	..	..	..	..	500	..
,, Lar	..	..	..	..	700	..
,, Bavanat	..	..	..	..	....	..
,, Beihbahoon.....	..	..	..	..	500	..
Total....	430	50	44,000	2,000	35,200	7,000

into Shirauz from different places.—continued.

Mercury.	Steel.	Piece Goods.	Silk Piece Goods.	Broad Cloth.	Masulipatam Chintz.	Gold Cloth (Benares).	Shawls.	Camel Wool Cloth	Indigo.
T. M.	Pieces.	Pieces.	Pieces.	Pieces.	Boxes.	Boxes.	Bundles.	Pieces.	Boxes.
200	600	45,660	100	50	100	20	50	250	42
..	..	17,500	....	..	..	..	....	..	..
..	..	20,450	5,100	..	..	..	....	..	..
..	..	....	2,600	..	..	..	....	..	..
..	..	5,300	125	150	..	..	....	..	..
..	300	1,650	300	..	..	..	150	..	..
..	..	12,000	125	150	..	..	....	..	..
..	..	....	....	..	..	..	....	..	..
..	..	1,300	....	..	..	..	....	..	..
..	..	....	....	..	..	..	....	..	..
..	..	....	....	..	..	..	....	300	180
..	..	1,000	....	..	..	..	....	100	..
..	..	....	....	..	..	..	....	..	..
..	..	....	....	..	..	..	....	200	..
200	900	1,04,860	8,350	350	100	20	200	850	600

from Shirauz to different places.—continued.

..	..	....	....	..	..	..	....	..	..
100	..	51,750	50	30	60	10	105	200	190
..	..	....	....	..	..	..	....	..	..
30	..	5,300	50	..	10	3	23	40	..
..	..	....	....	..	..	..	....	..	..
30	..	....	....	..	10	5	16	..	30
..	..	250	....	..	..	..	....	..	..
..	..	....	400	..	..	..	....	..	..
..	..	600	....	..	..	..	....	..	..
..	..	500	....	..	..	..	....	..	..
..	..	1,000	....	..	..	..	....	..	..
..	..	....	....	..	..	..	....	..	..
160	..	59,400	500	30	80	18	144	240	220

Average of Merchandize Annually Imported

Names of Places.	Dyes.	Silk.	Opium.	Wool.	Madder-root.	Gallnuts.
	T. M.	Boxes.	T. M.	T. M.	T. M.	T. M.
From Bombay and Bushire	670	..	..	..	....	..
,, Ispahan	....	1,500	800	600	15,000	2,100
,, Yezd	....	100	900	500	20,000	..
,, Cashan	....	..	..	..	....	..
,, Tehran	....	..	..	..	....	..
,, Khorassan	....	..	..	..	....	..
,, Tabreez	....	..	..	..	....	..
,, Khisht and Kauzeroon	....	..	200	..	....	..
,, Jahroom	....	..	..	..	....	..
,, Neeriz	....	..	..	500	....	..
,, Lar	20,000	..	..	..	....	..
,, Kerman	4,000	..	..	1,000	....	..
,, Bavanat	....	..	..	..	....	..
,, Beihbahoon	....	..	..	..	....	..
Total	24,670	1,600	1,900	2,600	35,000	2,100

Average of Merchandize Annually Exported

To Bushire and Bombay	....	1,500	2,500	6,000	30,000	2,000
,, Ispahan	640	..	..	..	....	..
,, Yezd	....	..	..	..	....	..
,, Cashan	....	..	..	..	....	..
,, Khorassan	....	..	..	..	....	..
,, Tabreez	....	..	..	..	....	..
,, Kauzeroon and Khisht	....	..	..	..	....	..
,, Jahroom	....	..	..	..	....	..
,, Neeriz	....	..	..	..	....	..
,, Lar	....	..	..	..	....	..
,, Bavanat	....	..	..	..	....	..
,, Beihbahoon	....	..	..	..	....	..
Total	640	1,500	2,500	6,000	30,000	2,000

into Shirauz from different places—continued.

Cotton.	Quince seed.	Cummin seed.	Saffron.	Saleb.	Hides.	Brass.	Drugs.	Carpets and Rugs.	Felt Pieces.
T. M.	T. M.	T. M.	T. M.	T. M.	Pieces.	T. M.	Loads.	Nos.	Nos.
....	..	..	..	..	....	..	..	..	..
500,000	2,000	1,000	160	500	1,500	800	30	30	..
50,000	..	..	..	700	....	..	..	..	300
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	2,900	70	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	200	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	100	..
....	..	1,000	..	..	....	..	..	120	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	300	..
550,000	2,000	2,000	160	1,200	1,500	800	2,930	820	300

from Shirauz to different places— continued.

1,000,000	2,000	2,000	150	1,000	....	..	400	1,500	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
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....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
....	..	..	..	..	....	..	..	..	..
1,000,000	2,000	2,000	150	1,000	....	..	400	1,500	..

Average of Merchandize Annually Imported

Names of Places.	Dates.	Tobacco.*	Gunpowder.	Saltpetre.	Lead.	Almonds.
	T. M.	T. M.	T. M.	T. M.	T. M.	T. M.
From Bombay and Bushire	..	....	..	..	..	..
,, Ispahan	..	....	..	..	..	..
,, Yezd	..	....	..	..	..	..
,, Cashan	..	....	..	..	..	..
,, Tehran	..	....	..	..	..	..
,, Khorassan	..	....	..	..	..	..
,, Tabreez	..	....	..	..	..	..
,, Khisht and Kauzeroon	20,000	4,000	..	..	..	..
,, Jahroom	10,000	1,00,000	6,000	2,000	..	..
,, Neeriz	..	....	..	..	6,000	30,000
,, Lar	..	20,000	1,500	1,000	..	..
,, Kerman	..	....	..	..	..	..
,, Bavanat	..	....	..	..	..	15,000
,, Beihbahoon	..	200	..	..	..	..
Total....	30,000	124,200	7,500	3,000	6,000	45,000

Average of Merchandize Annually Exported

To Bushire and Bombay	..	2,000	..	..	..	37,000
,, Ispahan	..	1,60,000	..	..	..	..
,, Yezd	..	1,000	..	..	..	..
,, Cashan	..	6,000	..	..	..	..
,, Khorassan	..	4,000	..	..	..	..
,, Tabreez	..	....	..	..	..	..
,, Kauzeroon and Khisht	..	....	..	..	..	..
,, Jahroom	..	....	..	..	..	..
,, Neeriz	..	....	..	..	..	..
,, Lar	..	....	..	..	..	..
,, Bavanat	..	....	..	..	..	..
,, Beihbahoon	..	....	1,000	..	..	..
Total.....	..	1,73,000	1,000	..	..	37,000

into Shirauz from different places—continued.

Dry Fruits.	Horses.	Mules.	Specie.	Raisins.	Assafœtida.	Rosewater.	Bidmeshk.	Plums.	Lime-juice.
T. M.	Nos.	Nos.	Tomans.	T. M.	T. M.	Carboys.	Carboys.	T. M.	Carboys.
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
3,000	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
5,000	..	..	....	..	..	....	....	..	....
..	5	100	....	..	..	....	....	..	....
8,000	500	100	....	..	..	....	....	..	....

from Shirauz to different places—continued.

2,000	200	..	4,00,000	11,000	2,000	20,000	2,000	500	....
..	..	..	....	..	..	....	....	..	1,800
..	..	..	....	..	..	....	....	..	150
..	..	..	....	..	..	....	....	..	60
..	..	..	....	..	..	....	....	..	120
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
..	..	..	....	..	..	....	....	..	....
2,000	200	..	4,00,000	11,000	2,000	20,000	2,000	500	2,130

Average of Merchandize Annually Imported into Shirauz—continued.

Names of Places.	Rice.*	Sulphur.*	Gums.*	Swords.*	Wines.*
	T. M.	T. M.	Nos.	Nos.	Carboys.
From Bombay and Bushire	.....	....	..	..	.....
„ Ispahan	.....	....	..	..	.....
„ Yezd	.....	....	..	..	.....
„ Cashan	.....	....	..	..	.....
„ Tehran	.....	....	..	..	.....
„ Khorassan	.....	....	..	..	.....
„ Tabreez	.....	....	..	..	.....
„ Khisht and Kauzeroon	.....	....	..	..	.....
„ Jahroom	.....	....	..	..	.....
„ Neeriz	.....	....	..	..	.....
„ Lar	.....	....	..	..	.....
„ Kerman	.....	....	..	..	.....
„ Bavanat	.....	....	..	..	.....
„ Beihbahoon	.....	....	..	..	.....
Total....	.....	....	..	..	.....

Average of Merchandize Annually Imported into Shirauz—continued.

To Bushire and Bombay	600	....	..	..	2,000
„ Ispahan	20,000	....	..	..	.....
„ Yezd	3,00,000	....	..	..	.....
„ Cashan	10,000	....	..	..	.....
„ Khorassan	.....	....	..	..	.....
„ Tabreez	.....	....	..	..	.....
„ Kauzeroon and Khisht	.....	....	..	..	.....
„ Jahroom	.....	5,000	150	..	.....
„ Neeriz	.....	....	..	..	.....
„ Lar	.....	....	..	..	.....
„ Bavanat	.....	....	..	..	.....
„ Beihbahoon	.....	....	..	100	.....
Total.....	3,30,000	5,000	150	100	2,000

LEWIS PELLY, Lieutenant Colonel,
Acting Political Resident Persian Gulf.

British Residency, Bushire, 14*th October* 1863.

CASPIAN
SEA
GEOLOGICAL
Sketch Map
of the
TURKO-PERSIAN FRONTIER,
by
W. K. LOFTUS, F.G.S.
PERSIAN
GULF
TABLE OF SOLTONS.
Frontier Line
Limit of Section

To Lieutenant Colonel Lewis Pelly,

Acting Political Agent and Consul General Persian Gulf.

Bushire, 6th October 1863.

Sir,—I do myself the honour to forward fragments of rocks collected during our late journey to Shirauz.

As I am unable to make even a rude sketch, I take the liberty of attaching a geological sketch map by Mr. Loftus, which, with a few remarks from myself, may lead to the identification of the specimens.

Entering Persia from the coast at Bushire there is first a plain some thirty miles broad, and behind that mountain ranges of sandstone and gypsum.

In the midst of the sandstone rises the hill of Geeseckoon. This is an elongated saddle of limestone some three or four thousand feet high, and having a quaquaversal dip; its direction is NNW. The upper two strata are fractured so as to form a cliff facing westward, and from the base of this cliff half a dozen streams of water run through deep gorges down the face of the mountain. The strata are one or two hundred feet thick. Two form the cliff, and the other four specimens were got in the clefts formed by the streams. They are marked, from above down Geeseckoon Nos. 1, 2, 3, 4, 5, and 6. In the gorges different coloured limestones are deposited horizontally upon the main rock. They are marked from above down Geeseckoon Nos. 7, 8, 9, 10, and 11.

At the base of this mountain, on the West side and at the Southern end, low ranges of sandstone, gypsum, and conglomerate overlie the limestone as it dips (Nos. 12 and 13). Here are two strata of gypsum and an intermediate one of conglomerate, the whole about forty feet thick, dipping west at an angle of 80°, and impregnated with bitumen (Nos. 14 and 15): this is the coal of Geeseckoon. West of that is a low range of limestone (No. 16) dipping west at an angle of 70°. Westward still sandstone and gypsum, and west of all bounding the plain, a low limestone range (No. 17) with a quaquaversal dip, and full of fossil wood.

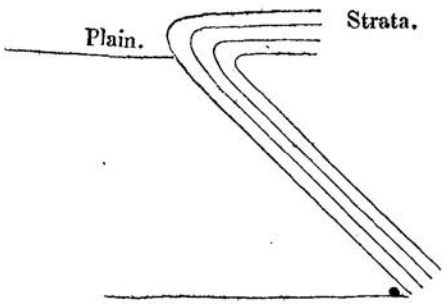
From Dalakhi to Kisht the rocks are of the gypsiferous series. For the first half of the way they are not above five hundred feet high, dipping East at an angle of 50°, and composed of sandstone, gypsum

and marl. Some of the sections are bright almost as the rainbow. Dalakhi-Kisht Nos. 18, 19, 20, 21, 22, and 23, represent specimens from one of those sections taken from above down. For the rest of the way the rocks are twice the height, some dip North and some West, and all are composed of sandstone and conglomerate. Nos. 24 and 25 are specimens of those rocks.

Kisht is a plain about one thousand feet above the level of the sea and supported by the innermost of those ranges. It has every appearance of having been the bed of a lake.

The rocks from Kisht to Kemaridge are also of the gypsiferous series. For the first third of the way they are formed of two different coloured sandstones (Kisht-Kemaridge Nos. 26 and 27), each stratum being about six feet thick. The rocks are about five hundred feet high, and dip in all directions, and are destitute of vegetation.

For the other two-thirds of the road the rocks are higher, and composed of gypsum and sandstones of many different colours. In some strata the gypsum is pure white, and in others it is mixed with marl. Kisht-Kemaridge Nos. 28, 29, 30, 31, 32, and 33, represent specimens of the sandstones and gypsum. These rocks are destitute of vegetation, and dip SW., at an angle of 45°. The innermost, supporting the plain of Kemaridge, is quite one thousand feet high, and the strata, when they reach the top, bend back in a curious manner, on a level with the plain.



The plain of Kemaridge is bounded on the South by conglomerate rocks (Kemaridge No. 34), on the East by the limestone range separating it from the valley of Kazeroon (Kemaridge No. 35), and on the west by sandstone and gypsum (No. 36).

The valley of Kazeroon, five miles wide, is bounded on the East and West by high ranges of limestone, both having the quaquaversal dip. Kazeroon Nos. 37 and 38 represent specimens from the range on the West, and Kazeroon Nos. 3, 40, 41, and 42, are of strata from the range on the East side; these were found at the pass of the Kutal-Dochtar; they are marked from above down. In this valley, at the base of the East range, is a string of mounds composed of sandstone, marl, and gypsum. The strata dip West at an angle of 75°, and are from twelve to fifteen feet thick. They are numbered from above down Kazeroon Nos. 43, 44, 45,and 46.

Passing over the Kutal-Dochtar we get into the valley of Desht-i-Ber, which is an oak forest. Bounding the South of this valley is a low dentated range of limestone, of which Desht-i-Ber No. 47 is a specimen.

Bounding the east of the valley of Desht-i-Ber is the range over which the Kutal Peer-i-Zan passes; Desht-i-Ber No. 48 is the specimen. This is the highest range round, and is the water-shed in this part of the country. It runs NNW., has a quaquaversal dip, is black on the surface, and is covered with masses of rock, from the crevices of which the dwarf oak grows. In those crevices and in the rents a soil, formed from the debris of the rock, has been deposited; Desht-i-Ber No. 49 is a specimen of the soil.

The plain of Desht-i-Arjen has evidently, within a recent period, been the bed of a lake; indeed, half of it is still a marsh. It has the highest elevation of any plain between this and Persepolis, and is about one thousand feet higher than Shirauz itself.

It is bounded on the South by limestone rocks in irregular masses divided by valleys filled with dwarf oak and hawthorn; on the East and West are limestone cliffs about two hundred feet high, and on the North sandstone and gypsum. The soil is a black alluvial deposit.

The Eastern cliff at the North end is very distinctly seen escaping from underneath the gypsum, the whole dipping Northward at an angle of 15°. Desht-i-Arjen No. 50 is a specimen of that cliff, and No. 50A are a few fragments of fossils or their casts found there. Nos. 51 and 52 are from the two strata of rocks between No. 50 and the gypsum above.

No. 53 is a specimen of the cliff on the West side, and springing from this in a considerable stream from a hole in the rock is clear water of a temperature of 57½° in August. No. 54 is from the bed of this stream as it issues from the rock.

From Desht-i-Arjen to Shirauz the rocks are of the gypsiferous series. For the first six miles they are ragged and steep, and covered with oak and hawthorn, but for the rest of the way they are low, rounded and only slightly covered with grass and brushwood. The soil being formed from the underlying rocks, is streaked blue and red, from the sandstone being in many places impregnated with iron. The strata of gypsum have worn away more than the sandstone, so that there are cross ridges and hollows, for the strata are generally nearly vertical. Desht-i-Arjen-Shirauz Nos. 55, 56, and 57, are from the side of a ravine where the hills are ragged. Nos. 58, 59, 60, 61, and 62 are from some of the strata where the hills are low and rounded. No. 63 is from the bed of the river Karaghatch passing through that part of the country.

The plain of Shirauz is bounded on the North-west by a high hill called Koe-Burf, formed of innumerable strata of sandstone and gypsum in alternate layers. The lower strata on the south side dip NE. at an angle of 25°, but up a little the strata are horizontal, and on the summit of the mountain is a large plain. Shirauz No. 64 is a specimen from a gypsum stratum. No. 65 has the remains of Algoe. No. 66 above is a mass of nummulites, and No. 65 above that is full of fuci and crystals of.....

The plain of Shirauz is bounded on the East by a range of limestone which is destitute of vegetation, and has the quaquaversal dip universal in those ranges. The strata vary in thickness from four to ten feet. They are numbered from above down Shirauz Nos. 68, 69, 70, 71, and 72. Shirauz No. 68A are fragments of fossils from this range.

To the East of this, and immediately behind it, is another limestone range, of which Shirauz No. 73 is a specimen. At the end of this a ravine runs, in which, under ten feet of earth, is a horizontal stratum of quartz gravel (No. 74) four feet thick, lying on clay (No. 75).

From this range to Zergoon the rocks on the North of the road are gypsiferous, and away to the South all limestone. The gypsiferous rocks are composed of red and grey sandstone and gypsum (Shirauz

Nos. 76, 77, and 78), in strata about six feet thick. Some of those strata are horizontal, others dipping North-west, and others vertical.

Bounding the West of the plain of Zergoon is a limestone range about eight hundred feet high, with strata about six feet thick. Zergoon, No. 79, is a specimen of the rock, and No. 79A are fragments of fossils from the same.

The plain of Zergoon opens into that of Persepolis. At Bend-Ameer a cliff of limestone runs North-west for about four miles. Bend-Ameer No. 80 is a specimen. No. 81 is a specimen from a rock about three miles long at the bridge over the Colvar water.

The range of limestone behind the ruins of Persepolis is black, and as the same as the ruins are of No. 82.

A little North-west of that is a low range on which the Nakshi-Regib is (No. 83).

Still North-west, across the river Paver and the pass to Tehran, is a cliff about one hundred and fifty feet high. In this are the tombs of the kings (No. 84).

No. 85 is from the bed of the river Paver as it enters the plain of Persepolis.

I have the honour to be, &c.

W. H. Colvill,

Civil Surgeon.

Memorandum on Bushire and its Districts.

Names of Places.	Distance from preceding Place.	Revenue, including Pishkash.	Tribes.	No. of Households.	Governor or Chief.
	Fursacs.	Tomans.			
Bushire	....	30,000	Arabs, Kazroonees Dehdasktees, Behbanees, Shenbedees, &c. &c. &c.	2,000	Mirza Ahmed Khan.
Reshire	1	1,200	Reshirees	300	Mahomed Jaffer.
Halileh	1	300	Pooladees	100	Reis Houssein.
Chaghudduk	4 from Reshire.	100	Kyedan	40	Reis Ismail.
Toolisiyeh	½	200	Behey	100	Bahmyar Agha.
Gooreek	¾	150	Mushayaks	50	Reis Hajee Ghooloom Reza.
Chakoota	2	500	Dunnooks	400	Sheikh Houssein.
Ahmedy	¼	150	Benroomy	70	Reis Khuluf Muhana.
Houseinekee	¼	150	Behey	50	Reis Jassem ben Abdlheblaee
Aboothuweel	¼	60	Bajlany	60	Reis Sheikh Abdulla.
Bunder Reeg	14 from Bushire.	1,200	Zoab	100	Zabit Ghooloom Khussab.
Angalee	6 from Bushire.	600	Mushtoonee	60	Houssein Koolee Khan.
Hyderee	¼	50	Hyderees	50	Reis Ahmed Shah.
Hufjoosh	¼	30	Amadheeny	30	Reis Hajee Houssein.
Nowkal	2	20	Moomberry	20	Reis Kayed Mahomed.
Village of Hassan Mahomed Kolee	1	20	Angalee	15	Reis Kayed Hassan.
Deh-Now	1	30	Amadheeny	20	Reis Mahdy.
Borazjoon	10 from Bushire.	4,000	Borazjoonees	400	Mahomed Hassan Khan.
Bondaroo	1	100	Bondaroozee	60 or 70	Reis Kayed Mahomed Ameen.
Surkoorra	½	60	Surkorrayee	40	Reis Kayed Sharyaree.
Durcheetoo	¼	30	Arab of Khuraysat.	60	Reis Saaddoon.
Chahkhaner	¼	40	Khooshabee	50	Reis Sheikh Ahmed.
Esawendy	¼	100	Ditto	10	Reis Hajee Ahmed Tungistoonee.
Khooshab and Khooshkhan	1 from Esawendy.	150	Khooshabee and Khooskhanee.	150	Reis Mirza Ally Beg. Reis Mahomed Ally Beg.
Zeearuth	½	600	Zeearuthee	400	Mirza Assud.
Suffeeabad	2	600	Suffeeabadee	80	Kayed Hyder.
Boonar	1½	100	Boonaree	70	Reis Kayed Ismail.
Koiloll	1½	100	Koilollee	100	Reis Kambar.
Deh Kayed	2	700	Deh Kayedee	200	Reis Mahomed Ally.
Bargahee	1½	30	Bargahee	40	Reis Bauker.
Geesukoon	4	60	Geesukanee	50	Reis Moollah Houssein Khan.
Zungenna and its districts	.....	9,000	.....	....	Bauker Khan Tungistoony
Abad	8 from Bushire.	550	Abadehy	150	Reis Hajee Khodabuksh.
Sumul	1½	300	Zungenna	160	Reis Hajee Abool Houssein Tungistoony.
Surkewereoon	7	1,200	Arab Lahsahy	200	Reis Moollah Ally
Beyberrah	1	1,000	Zengenna	50	Reis Mahomed Ameen Beg.
Dahlikee	1½	3,000	Dahlikee	150	Bauker Khan Reis Moollah Mirza Ally.
Koodhilla	9 from Bushire.	2,200	Arabs	100	Reis Saleh Soweydee.
Koorrabund	2	250	Koorrabundy	80	Reis Kayed Ismail.
Raleh Sookhteh	1½	150	Arabs	100	Reis Khuluf Rahman.

Memorandum on Bushire and its Districts.—(continued.)

Names of Places.	Distance from preceding Place.	Revenue, including Pishkash.	Tribes.	No. of Households	Governor or Chief.
	Fursacs.	Tomans.			
Askerree	½	200	Arabs	100	Reis Houssein Ghoolloom.
Mehreezy	½	250	Ditto	150	Reis Mejnoon.
Roostheury	½	400	Ditto	300	Reis Mahmood.
Chum Hulkan	½	100	Ditto	30	Reis Humood.
Village of Hajee Hijjee	1	200	Ditto	30	Reis Mahmeed.
Furrakeh	1	150	Ditto	200	Reis Khumees.
Village of Nukhl	¼	300	Ditto	60	Reis Saleh Hijjee.
Gowabee	1	250	Ditto	60	Reis Sheikh Rashid
Mahomedy	½	300	Ditto	50	Governor of Roodhilla.
Mojnoon	½	200	Ditto	40	Reis Yahseen.
Fort of Sehran	¾	100	Ditto	60	Reis Houssein Salmin.
Zeera	12 from Bushire.	1,200	Zeerayee	30	Zabit Hassan Khan.
Dooroodah	1½	600	Dooroodgahy	200	Reis Moollah Melik.
Thul-i-Serkoh	1	30	Zeerayee	20	Reis Houssein.
Thul-i-Ali Suffer	1000 paces	70	Ditto	25	Reis Jaffer.
Mahomed Abad	1 far.	100	Ditto	50	Reis Mahomed.
Sehdeh	3	100	Ditto	15	Reis Alee Moorad.
Thul-i-Katel	1	70	Ditto	20	Reis Abdoo.
Amooyer	1½	50	Mixture of several tribes	20	Reis Mollah Mahomed.
Nezzer Aghayer	1½	60	Zeerayee	30	Reis Mahomed Iwez.
Shuboonkarreh	12 from Bushire.	3,500	Shuboonkarehy	300	Zabit Sohrab Khan.
Mukaberry	4	200	Arab	60	Reis Fares.
Chum Tungan	2	150	Shuboonkarehy	50	Reis Hyder Kerblai Ali.
Basry	1½	150	Ditto	40	Reis Ahmed Shah Hyder.
Dashty	1	200	Ditto	60	Reis Hajee Hyder Wuliee
Bunaree	2	300	Ditto	70	Reis Kayed Abbass Kolee.
Bunaree Suleymanee.	1	150	Ditto	50	Reis Kayed Mahomed Kolee.
Dhurwehy Chehar Boorj	1	250	Ditto	50	Reis Behrooz Angalee.
Dhurwehy Pahrood	½	1,500	Ditto	60	Reis Hajee Houssein.
Thurkaky	1	300	Ditto	60	Reis Mahomed Reza.
Boormabad	¼	80	Ditto	30	Reis Kayed Mahomed Kolee.
Seh Konar	1	60	Ditto	200	Reis Hyder Kerblai Alee.
Genawehgoon	3	40	Ditto	70	Reis Aliee Beg.
Boweyree	2	300	Ditto	60	Reis Ali Kolee Khan.
Dehkoneh	1	300	Ditto	200	Governor Sohrab Khan.
Zekeryayee	1	150	Ditto	40	Reis Kayed Shaw Kolee.
Mahomed Jeamuly	½	100	Ditto	30	Reis Kayed Houssein Sabz Alee.
Layeh Pah	½	50	Ditto	20	Reis Kayed Ghoolloom Tahmasp.
Shah Ferooz	¾	50	Ditto	30	Reis Kayed Mahomed Kolee.
Dey Dharoon	1½	150	Ditto	40	Reis Hatim.
Chah Dhool	1	150	Arab	30	Reis Ghoolloom Shaab.
Outheeya	1	100	Ditto	30	Reis Khuluf Moftha.
Chehelgeree Arab	1	100	Ditto	30	Reis Mahomed Filfil.
Chehelgeree Ajem	1	200	Sheboonkarehee	50	Reis Kayed Abdulla.
Seemeh	1½	150	Khedree	40	Reis Kayed Behrooz.
Khuleefeher	1½	250	Khaleefeher	60	Reis Houssein-i-Khuleefa.
Shooldhan	2	80	Shaboonkarehee	30	Reis Kayed Ali Neky.

Memorandum on Bushire and its Districts.—(continued.)

Names of Places.	Distance from preceding Place.	Revenue, including Pishkash.	Tribes.	No. of Households.	Governor or Chief.
	Fursaes.	Tomans.			
Hyat Dawood	16 from Bushire.	3,000	Hyat Dawoodee	100	Zabit Khan Ali.
Beedhoo	6	80	Arab	25	Reis Abdulla Arab.
Roosoor	1	150	Hyat Dawoodee	25	Reis Hyder Kerrem.
Char Roosayee	1½	250	Ditto	50	Reis Kayed Abool.
Poozehgah	2	150	Ditto	25	Reis Hajee Alee.
Chehar Burj	2½	250	Ditto	40	Reis Houssein Kayed Abolal.
Chehar Mal	1½	250	Ditto	40	Reis Hassan Sujeh Pel.
Mal Mahmeed	3	250	Ditto	50	Reis Houssein Shah Kolee
Kah Suffer	1	100	Ditto	20	Reis Hyder.
Kah Suffer, 2nd	1	80	Ditto	30	Reis Abdali.
Chem Shuhab	2	70	Ditto	40	Reis Kayed Hajee.
Mal Bawa	4	200	Saadut..	40	Reis Syed Nasir.
Ahmedseen	2½	150	Ahmedseen	30	Reis Kayed Abdali.
Abbassee	3	300	Hyat Dawoodee	30	Reis Bahmyar.
Mahomed Sadi	2	250	Ditto	40	Reis Behrooz Shah Kolee.
Genaweh	3	500	Ditto	150	Reis Khan Ali Khan
Shool	5	300	Ditto	60	Reis Shems-ud-deen.
Ahsham Abdali	3		Shooly	20	Ditto
Kotinr	½		Ditto	150	Ditto
Kemalee	1		Ditto	80	Ditto
Dehrawery	2	120	Hyat Dawoodee	40	Reis Kayed Ali Boland.
Bahmyaree	½	300	Ditto	250	Reis Kayed Bahmyar.
Deelum	22 from Bushire.	1,100	Arab	120	Zabit Ahmed Mahomed Taher.
Tungistan	....	1,400	Meeseegul	70	Reis Hajee Ali.
			Pooladees	60	Reis Ibrahim Houssein.
Bachek	2	150	Pooladees	150	Reis Hyder Zar Houssein.
Zundabee	½	100	Zundabee	100	Reis Mahomed Ruffer.
Boneh Gez	½	150	Darweishy	100	Reis Poolad.
Soorukee	2	60	Goothooee	40	Reis Ghoolloom Houssein.
			Jemaniee	100	Reis Abdul Houssein Hajee Ahmed.
Goolukee	1	100	Munseeree	80	Mother of Ahmed Shah Khan, and wife of Mahomed Alee Khan.
			Jeidalee & Dashtees	70	
Chahthulkh	½ from Tungistan.	40	Zendheby	40	Reis Zar Jongheer.
Goheenuk	½	100	Goheenukee	100	Reis Abd Reza.
Dilbar	2	50	Mudhoomerry	100	Reis Ghoolloom Houssein.
Mudhoomerry		50			
Bashee	2	30	Bashee	30	Reis Mahomed Iwez.
Barekkee	1½	600	Barekkee	200	Reis Khuleel Hyder.
Ahram	2½ from Tungistan.	4,000	Dhoweroonee	500	Reis Kambar Almas.
			Khurgesthanee		Reis Hajee Mahomed Bauker.
			Dehmeeyoonee		Reis Kayed Abd Reza.
Khaweez	4	Included in above 4,000	Bahmyar	200	
			Thul-i-Gorgoon		
			Keshy		

LEWIS PELLY, Lieutenant Colonel,
Acting Political Resident and Consul General Persian Gulf.

A BRIEF ACCOUNT OF THE PROVINCE OF FARS.

Shirauz the Capital, and its Dependencies.

The circumference of the city of Shirauz is one fursac. Its walls are in ruins. The shape of the city resembles a lion in a recumbent posture. It had more inhabitants before the earthquakes than it has now. At the present day it contains 6,500 houses and about 45,000 inhabitants. It has also 150 public baths, 130 mosques, and a number of bazars. Three or four Imamzadehs, and most of the buildings, bazars, and baths were built by Kerim Kham-i-Zund. After the earthquakes, the wealthier inhabitants of Shirauz have erected some other good buildings. The Musjid is now built by the Ameer Atha Beg. Saadizungy having been injured by the earthquakes, was rebuilt by the Hajee Kowam of Shirauz, and in a better style than it originally had. The Madressa of Khan, built by Imam Kolee Khan Moolla in the reign of Shah Abbas, was also rebuilt by the Hajee Kowam. From 7,500 to 9,000 maunds of flour are consumed daily by the inhabitants.

The most remarkable places outside the city are—

The garden of Juhan Nemah, one of the gardens of Kerim Khan-Zund.

The Baghi Now, made by Houssein Ally Mirza Firman Firma.

The Baghi Thakhti Karji or Kajjir, made by the Atha Beg Karji. The buildings in this garden were erected by Agha Mahomed Khan Kajjir. Additions were also made to them by Houssein Khan Nazim-ood-Dowleh.

The Delgooshas; first founder is not known. Reza Kolee Khan rebuilt it a few years ago. It is now the possession of the Hajee Kowam.

Hoft-tenann is an ancient building. Kerim Khan-i-Zund repaired it.

Some of the trees there are 300 years old.

Chehel-tenann was also built by Kerim Khan-i-Zund.

Hafezieh contains the tombs of Khojeh Hafiz and two other of the most renowned poets of Shirauz, named Ashly and Helanly, and was built by Kerim Khan.

Saadieh contains the tomb of Saady, and was also built by Kerim Khan.

The city of Shirauz has 10 quarters; five of these are called Hydereekhaneh, and the other five Maame-ti-Khani; viz. Maydhan-i-Shah, Bazaar-i-Moorgh, Darweish-Azadeh, Ishaak Beg, Balugood-Sung-i-Siah, Sur-i-Doozekh, Lub-i-ab-Sur-i-Bagh, and Durb-i-Musjid.

It possesses six gates, which are thus known—Ispahan gate, Bagh-i-Shah gate, Kauzeroon gate, Shah Dai-oollah gate, Khassab Khani gate, and Saady gate.

People of every art and profession reside in it.

The customs, mint, police, &c., are all contracted for by the Kulanter.

West of Shirauz the following villages exist:—Goozom, Abbassabad, Do-Koohek, Anjireh, Dinekan, Boozeen, Kooshki, Bibicheh Kandily, Kasr-el-Dusht, or Musjid Bardy, Koshen, Ahmedabad, Shirabad, Kooshki-Abbass-Ally, and Korreh.

Musjid Bardy possesses 1,000 gardens and about 50,000 vineyards. Inclusive of the village of Korreh, which is adjacent to it, it has 600 or 700 houses, and 2,000 inhabitants. The hills of Musjid Bardy contain the pits which supply the inhabitants of Shirauz with snow for the summer.

The villages South-west of Shirauz are as under:—

Shapoorjan, Sultanabad, Hosseean, Deehuk, Dowlutabad, Kooshk-i-Haleel, Doodmoon, Dehnow, Bakhoon, Aliabad, Vezeerabad, Gardikhoon, Sahlabad, Kobolabad, Kurchool, Mahferoozoon, Jafferabad, Fenehan, Banian, Sheikh Ali Choopan, Deh-pialeh, Dayehjan, Boorhanabad, and Ajivad.

The villages behind the hills which are dependent on Shirauz are:—

Shool, which is 10 fursacs from Shirauz, produces grapes. Its inhabitants trade mostly in charcoal.

Khoollar is 9 fursacs distance from Shirauz. It produces the grape from which the celebrated Shirauz wine is made. This wine is exported to many places. Some of the vineyards are said to be 1,000 years old. Its inhabitants are warlike: they trade in charcoal.

Kelat is six fursacs West of Shirauz. Its hills possess a spring distant 50 yards from the village. This spring works four flour mills. The

produce of Kelat is grapes. The fort of Kazul Arselan is reported to have stood in this place.

Zerkhan is situated five fursacs North of Shirauz. It contains 600 or 700 houses, and 2,000 inhabitants. Soap and dungaree are manufactured here; wheat and barley are cultivated here and vegetables. The inhabitants possess mules and donkeys, which they let out on hire as carriage animals.

Luphooyee is situated five fursacs North of Shirauz. The soil produces wheat, barley, and vegetables.

Sheikh-Bood is also five fursacs North of Shirauz, and produces wheat, barley, and vegetables.

Kechel Ahmedy is situated East of Shirauz, between four hills. It produces only wheat and barley.

Dodeh Daurian, Kooshk-i-Moollah, and Layepeh, are situated seven fursacs East of Shirauz, and produce wheat, barley, cotton, and vegetables.

Bardeh is situated four fursacs East of Shirauz, and produces a very small quantity of wheat and barley. Its inhabitants manufacture dungaree. They have no cultivation of their own, but work for the people of Layepeh.

Pus-Koohek lies West of Shirauz, produces a very small quantity of wheat and barley. Its inhabitants trade in charcoal. The climate of this place is good, and it has many springs of water.

The districts of Fars consist of Abadeyee Soornieree, situate North of Shirauz. Produce wheat, barley, and raisins: possess some gardens. It is celebrated for the manufacture of wooden spoons. Celebrated also as being the hunting place and summer residence of Bahram-i-Goor.

Abadiyeh Tashtak and Sur-Chehan are the names of two small villages situate on the North-east of Shirauz. Their produce is wheat, barley, and almonds. Gardens also are to be found here.

Ardhekoon is situate West of Shirauz. It produces grapes and wash-mud known as the Gel-i-Sershoor.

Akleed is situate North of Shirauz. It produces wheat, barley, and Indian corn, and is celebrated for its good apples, and possesses many gardens.

Ized-Khast is a village situate North of Shirauz, and produces only wheat and barley.

Abreh is situate on the hills North of Shirauz. It has two divisions, one called Dashtak, containing many gardens and springs of water, and a fort, which is considered the coolest spot in Fars. The other division is called Shahrek, and consists of two or three villages producing only wheat and barley.

Abneh is a small village situate West of Shirauz. It produces grapes and is celebrated for its syrups. Wheat and barley are cultivated here, but in very small quantities.

Assio and Alla Marvdasht are situate North of Shirauz, and produce dates, wheat, and barley.

Afzar and Koonj are situate North of Shirauz. Afzar produces wheat, barley, cotton, and sesame. It has one garden and a few date trees. Koonj contains the ruins of ancient mosques and manufactories, and is supposed to have been a town originally. The inhabitants are all Sunnies.

Astabaneh is situate East of Shirauz, and produces wheat, barley, opium, and saffron: possesses some gardens; the inhabitants are mostly Moollahs. Good crockery is manufactured here, and it is celebrated for having a large Poplar tree, said to be 400 years old.

Arbaa is close to Ferozeabad, and has four villages, viz., Hanjam, Abaderim, Rood-balayeh-Orlia, and Rood-balayeh-Siftia.

1. Hanjam is celebrated for its gardens and fruits.
2. Abaderim has very few inhabitants, and produces dates, wheat, and barley.
3. Rood-balayeh-Orlia, and
4. Rood-balayeh-Siftia, known also as Borazjoon. These produce rice.

Dehrooyeh contains a mine of lead in its mountains and along the river passing through it. The remains of ovens in which the lead used to be prepared in ancient times are still visible here. It produces rice, wheat, and barley. One of its villages, named Pinjeh-sheer, contains a dome situate between four mountains, and holds five tombs of renowned personages. It also has some gardens and date trees.

Beyzah is a large district situate North-west of Shirauz. It produces rice, wheat, and barley, and possesses some gardens. In the centre of this district there is a meadow, in which 6,000 mares, belonging to

Houssein Ally Mirza, used to graze during three spring and three autumn months every year. In summer these mares were sent by His Royal Highness to graze in the meadow of Kooshkezard, and in winter to the villages of Housseinabad and Sur-Mashleh, in the districts of Gereh.

Bavoonat is situate North of Shirauz: possesses many gardens and abundance of fruit, especially raisins. Good wooden spoons are manufactured here.

Jooyom and Bideshehr are situate South of Shirauz: their produce is wheat, barley, dates, cotton, rice, and sesame.

Jereh is situate West of Shirauz, and its produce is rice, cotton, and sesame. It possesses a few fruit gardens.

Housseinabad, Sur-Mashleh, Veleshabad, and Famoor, are villages dependent on this district.

Jahroon is situate South of Shirauz: had been the seat of kings in former days. The villages of this district are populous, and have many respectable merchants. Its produce is wheat, barley, and dates. One of its villages is named Dumban. It has some gardens celebrated for their melons.

Khafiak and Marvdasht produce wheat, barley, rice, Indian corn, and cotton. There are very few gardens here.

Thakht-a-Jamsheed (Persepolis) is situate North-east of Shirauz, and is a remarkably high building; it is dependent on Marvdasht. At this place there is a cave, wherein it is said the remains of ancient kings were deposited. This building in reality exhibits the grandeur of the (ancient) Kings of Persia.

Khisht and Kemarij are situate West of Shirauz, and their produce is wheat, barley, and rice. These places are celebrated for oranges.

Khajeyi is situate South of Shirauz, and produces rice, wheat, and barley, and possesses a vineyard.

Khafr is situate East of Shirauz, and has a village named Badenjan, from whence limejuice is taken to Shirauz in large quantities. Its fruits are very good. It has some date trees, and produces rice, wheat, and barley.

Jeriz and Assenjan are situate North-east of Shirauz, have many

gardens, and are celebrated for their pomegranates. Their produce is rice, wheat, and barley.

Darabjerd is situate East of Shirauz. It is a large district, and has seven streams of water. Its produce is wheat, barley, rice, tobacco, cotton, sesame, and limejuice. It has also some date trees.

Dashtistan includes also some very large villages, whose inhabitants are very vicious, but very warlike. Its produce is wheat and barley. The fort of Khoormooj has some date trees. The fort of Tungistoon on the sea shore is a very hot place. It has about 300 matchlockmen, who have fought with almost all the people of Dashtistan, and have always been victorious. Sumul has only some date trees. Borazjoon has a great number of date trees. Daulekee has also a number of date trees.

Dashty, to which three or four other districts have latterly been added, including the following villages, viz. Poosekoon, Dekekoon, Khoozerack, Booshkan, Senun, Thombeh, Thalek, Keleme, Kankey, Sarmastan, and Burdistan (its seaport), is situate South-west of Shirauz. Its produce is wheat, dates, barley, and cotton. There are about four or five thousand matchlockmen at Dashty. The Khans are endeavouring to improve Burdistan. For the last forty years the Dashtees have on three or four occasions attacked Congoon, plundered and killed a number of people, and induced the others to settle at Burdistan.

Ramjerd is situate North of Shirauz. It has a large stream of water, and produces rice, wheat, and barley.

Romiz and Fessaw are situate East of Shirauz: the remains of a fort, said to belong to Zehake Tazee are to be found here. The cypress trees of these places are very high and bulky, and said to have been planted by Zerdosht the prophet. The produce of these places is wheat, barley, cotton, and Indian corn. They have very good gardens.

Chardonguh, situate North of Shirauz, produces grain, dholl, and wheat. This place is celebrated for being the hunting place of Bahram-i-Goor. It has large meadows for pasture, Kooskeyzard is celebrated for being the best of these meadows.

Siakh, on the West of Shirauz, praduces rice, wheat, and barley.

Semiroom and Dizzard are situate on the North-west of Shirauz.

The Kashkayi Eliants have their summer residence at these places. They produce wheat and barley.

Sarvistan is situate East of Shirauz. It produces wheat, barley, cotton, and Indian corn. There are many gardens in this place, the pomegranates of which are very good.

Shool and Delkhan are situate West of Shirauz, and their produce is grapes, wheat, and barley.

Shoolestan and the villages of Mamasany are situate West of Shirauz. Four tribes of Eliants reside here: the tribes of Rostem. Javidy, Bekosh, and Doshmenziary. All these tribes are poor, and addicted to plundering and murdering. The produce of these places are rice, wheat, and barley.

Kala Sefid is one of the most remarkable forts in the world. With 200 matchlockmen it can hold out against any number of soldiers. Ameer Teymoor Goorekan was the only person who succeeded in taking the fort.

Simekoon, situate North of Shirauz, has a stream of water. Its produce is rice, wheat, and barley. It has some gardens, the oranges of which are very good.

Ferozeabad is situate North of Shirauz. Its produce is rice, wheat, and barley. It is known as the place of worship of Zerdosht the prophet. Some of the buildings of Goshtasp Shah existed here, and the remains of a minaret can still be seen; the circumference of this minaret is said to have been about 50 or 60 yards, but at present only 30 yards remain. Ferooz Shah had built a fort on these mountains also, under which the rivulet of Ferozeabad used to pass.

Faul and Gulledar are situate South of Shirauz, and produces date, wheat, and barley. The inhabitants are Sunnies.

Ferashband, situate South of Shirauz, produces wheat and barley in large quantities. This place is said to have been the summer hunting place of Bahram-i-Goor, and contained 14 domes, seven at Abadehe Soormuk, and seven at Kooshkezard. These domes were of different colours, and were the abiding places of Bahram-i-Goor's wives, one in each dome, and had to dress according to the colours of their respective domes, whenever visited by their lord.

Keifery is situate North of Shirauz, and its produce is wheat, barley,

gram, and dholl. It is very pleasant here in summer, during which season the Arabs congregate at the place.

Kooshmerreh is situate South-west of Shirauz: has some villages on the mountains which produce grapes and figs. The people trade in charcoal.

Kevar, situate East of Shirauz, produces wheat, barley, and cotton.

Korball, situate North of Shirauz, produces rice, and a little wheat and barley. A stream of water has been artificially brought to these places by Ameer Azad-ed-dowleh Deylemy.

Kauzeroon, on the West of Shirauz, produces wheat, barley, and tobacco. There are grapes and figs in its mountains. It was populated by Shapoor Shah, whose likeness may be seen at Tanguchakoon.

Kemeen is situate North of Shirauz; has many gardens, and produces wheat and barley.

Mushhood-ommel-Nubbi is on the North of Shirauz, and its produce is wheat and barley. The tombs of Kaikhosrow and the mother of Solomon are said to exist here.

Meymend, situate South of Shirauz, has many gardens, and its produce is wheat, barley, and almonds. No revenue is paid to Government for this district.

Mayin and Kondazy are situate on the North of Shirauz, and produce wheat and barley. The latter is situate on the mountain, and produces grapes.

The Eliants of Fars.

Kashkayi and Khellokh. The former is constituted of a number of tribes, are under the rule of one chief, named Mahomed Kolee Khan; have 15,000 households, 3,000 of which are of the family of the Khan. They have about 2,000 cavalry and 1,000 infantry under the Serhan Arsad Khan, son-in-law of the Ilkhanee. The Kashkayi tribes are named as follows:—viz. Valkeh, Jafferbeggy, Kashkooly, Shishboolooky, Rehimy, Ekhcheloo, Kohdadeh, Demirchakhmakhloon Seifikhany Farsimedoon, and Fercany.

Ille Khamseh are five tribes, and each have a Ketkhoda. One regiment of these tribes is under the command of Reza Kolee Khan Sertip:—

1. The Ille Arab has about 6,000 households who are entrusted to the care of Reza Kolee Khan.

2. Abol Verdih are the Khans of the whole tribes of Khamseh, who at one time had great influence, but now they are engaged in trade, and most of them are in the Shah's regiments. About 500 ryots of this tribe may only be seen in their country.

3 and 4. Nafar and Bheharloo are two other tribes of the Khamseh. The former are quiet and poor ryots, but the latter are very mischievous, and a set of robbers, who by killing each other have put an end to themselves and their ketkhodas, and all that remains of them are some horsemen, who wander about plundering every one that comes in their way.

5. Einaloo are all ryots, part travelling in the country and part settled at Fursaw. Chardercherik and Daderyat were independent tribes, but for the last 20 years they have been attached to the Ilkhanee, and pay an annual tribute.

Lar or Laristan was given to Gorgeen-i-Meylar by Kaikhosrow when he divided Iran between his generals, and it is said the descendants of Gorgeen ruled at this place so long at the Saffavian dynasty ruled, when Shah Abbass the Great, called the Ruler of Lar to Ispahan, one of the last surviving descendants of Gorgeen, went there and took with him the crown of his ancestors as a present for the Shah, and died at Ispahan. The produce of Lar is dates, wheat, and barley. It has very few wells. The people are supplied from tanks of rain-water, of which there are about 12,000 at Lar; some of them have cost about 2,000 or 3,000 tomans. An engineer has constructed a canal around the city of Lar, by which all the tanks thereabout are filled with water. It serves also as a trench for defending the place in time of need. There are about three or four forts in the mountains of Laristan: one of these is named Jerash. The houses of the ryots are to be found at its base, and a little higher those of the ketkhodas, and possesses adjacent to it a tank of water enough to supply the inhabitants of the place for a whole year.

Mehale Sabaa and Forg. The former produces dates, wheat, and barley, and the latter rice and every sort of fruit.

Jehangeeriye is situate on the sea-shore, and its seaport is Moghoo. The villages Vaeshkenan, Terakema, and Bastak, are dependent on

this district. Bastak is situate between four mountains. The people are wealthy. They do not pay to Government anything beyond the usual revenue. They have about 2,000 matchlockmen. Reidan and Ahmedy, situate South of Shirauz, are near Bunder Abbass, and produce a large quantity of dyes.

Koohgeeloye, Chaabe, and Ram Hormuz. The first has some Eliants, who are divided into four tribes—Boveir, Ahmedy, Bahman Bawy, and Nooyi. They have about 4,000 or 5,000 households. The largest town is Beihbahoon. The inhabitants of that place are mostly Syuds of a respectable descent, who sometimes are entrusted with the government of the place. There are a number of goldsmiths there celebrated for making the best kaliuns.

Chaabe is sometimes attached to Koohgeeloye.

There is a fort on the mountains of Beihbahoon named Golab. The Khans of Mamasany took refuge here when they were expelled from the Kala-Sefid by an English Officer (in the employ of the Persian Government) named Lindsay. This officer pursued them, and with great difficulty forced them to abandon the fort, and captured Veli-Khan their chief. All the places named above are situated on the West of Shirauz, and their produce is dates, wheat, and barley.

The Seaports of Fars.

Bunder Abbass was founded by Shah Abbass the Suffavy, who also erected there a fort, which remains to this day; some buildings erected by the Dutch are also to be found there. The Dutch settled there ages ago, and remained there until the reign of the Atha Begs. It was originally a very large town. The Imaum of Muscat has farmed Bunder Abbass, Shemimy, and Minaw from the Persian Government for 16,000 tomans. The revenue was only 4,000 tomans during the reign of Futtah Ally Shah, and afterwards 6,000 tomans; but four or five years ago the Imaum did not wish to pay the annual revenue, and brought some of his men to fight against the Persian Government. Persian troops were sent to engage them, and they succeeded in expelling the Imaum and his men from Bunder Abbass. The chief merchant of Bushire interceded for the Imaum, and it was then arranged that the Imaum should pay 16,000 tomans annually. The climate of this place is very unhealthy.

Bunder Lingah is a trading port; a number of Jahroom and Lar merchants reside here. The revenue of this place is very trifling.

Bunder Assaloo was some 50 years ago ruled by Sheikh Khulfan, who was a very respectable man, and of great influence, as also a good ruler. His sons are not so, and in consequence the place is daily going to ruin.

Burdistan is one of the seaports of Dashty; the Khans are taking great care to improve it. Many of the people of Congoon have settled there.

Bunders Congoon and Taurie. Some 100 years ago Bunder Taurie was in a better condition. It then contained about 100 Indian merchants and some good buildings; these are now in ruins. Bunder Congoon was once well inhabited, and its Chiefs, Sheikh Mahomed Khan and Sheik Jubbareh Khan, had well distinguished themselves among their tribes, but Jemal Khan and Houssein Khan Dashty, through jealousy went and destroyed the place and plundered the Khans of wealth. Sheikh Hassan Khan, aided by the Persian Government, is now trying to put the port into order again.

Bunder Abushire. Formerly Reshire was a well inhabited seaport, but the ancestors of Sheikh Abdool Russool Khan settled at Aboosheer and encouraged others to settle there also; owing to the English Government keeping peace and order at sea, the place has become a good trading port. The Governors, too, are not able to oppress the ryots, and the consequence is, that the place is improving daily and that trade is flourishing.

True translated substance.

(Signed) GEORGE LUCAS,
Interpreter, &c.

(True copy)
LEWIS PELLY, Lieut. Colonel,
Acting Political Resident and
Consul General Persian Gulf.

(True copies)
W. H. HAVELOCK,
Officiating Secretary.

ART. VIII.—*Report on the Bay and Fort of Shewoo on the Shore of the Persian Gulf.*—By H. W. WARNER, Esq., Commanding Residency Schooner "Georgiana." *Contributed by Government.*

[Read before the Society, January 21st, 1864.]

I HAVE the honour to submit a useful and interesting report by Mr. Warner, Commanding the Residency Schooner "Georgiana," on the Bay and Fort of Shewoo on the Persian shore of this Gulf, Latitude 27° 04′ 22″ N. and Longitude 53° 08′ 51″ E.

2. Mr. Warner sought shelter in this Bay during heavy weather in his late cruise.

I have the honour to be, &c.,

(Signed) LEWIS PELLY, Lieut. Colonel,
Acting Political Resident and
Bushire, 9th November 1863. Consul General, Persian Gulf.

Brief Report on the Bay of Shewoo and its Village.

SHEWOO BAY or Bunder Kelat (called so by the natives, owing to the West promontory having been fortified by the Potuguese, of which scattered remains of ruins may be seen to this day,) affords shelter to small vessels during North-westerly gales, but is perfectly exposed to the prevailing winds from other quarters, and cannot be recommended as a desirable bay to shelter vessels of a large size, owing to the coast being steep, and vessels having to be in 7 to 8 fathoms to avoid a heavy swell setting in round the West point.

The bay abounds in fish of all description, and fresh provisions, wood, and water can be procured at a moderate rate, but vessels requiring water would have to go with their own boats and casks (as the villagers have no proper conveyance, their boats being of a very small size), and only in moderate weather as there is no landing place off the village in a North-wester, and the one at the West Cape, round a small spit is difficult to round in heavy weather, owing to a heavy surf rolling past.

The Political Residency Schooner "Georgiana" sought shelter here during a strong North-westerly gale; rounding the West Cape at a distance of ¼ of a mile in 10 fathoms, and bringing up with the Cape, W. by N. ¾ North, distant 2 miles, and the village fort E. by South distant 3 miles, and about ¼ of a mile off shore in 7 fathoms good holding ground sand and shells. Rise and fall 8 feet, S. T.

From where the schooner was anchored, a rock above water, and about ¼ of a mile off shore (not marked on the general charts) with discolored water beyond, was discernible running out to some distance and to the Northward and Westward of the village. On inquiry I was informed that there was good anchorage for smaller vessels round and abreast of the rock from 4 to 12 fathoms, but shoaler to the Northward, and that the West Cape was always preferred in rough weather.

Owing to the state of weather, and being pressed for time, prevented my inquiring more minutely into this subject, otherwise I might have obtained better information.

The following miscellaneous information was given me by the Sheik and one of the villagers who had visited the undermentioned places:—

It appears the coast is generally yearly visited by a detachment of His Royal Highness the Shah's troops, accompanied by two to three pieces of Artillery, the usual number of troops being about 3 to 4 hundred strong. They had not heard of their being in the neighbourhood this year.

(But I happened to be aware of their having visited Leur and Bunder Abbass instead.)

There are two roads practicable to Artillery leading from Shirauz to the coast; one leading to Gabendy, and one to Leur, and thence to Bunder Abbass.

The dangerous passes are all walled, but no record as to when built could be given, and when requiring repairs, taxes were raised from the nearest villages, or more frequently repaired by travellers having occasion to go that way, as a regular traffic takes place to the coast throughout the year by both these roads.

The road by land from Shewoo to Lingar or Bushire is perfectly safe; horses, camels, and donkeys procurable at nearly every village

the greater part of the road takes place by the sea coast, and the rest, between the hills.

I do not mention the stations met with between Bushire and Lingar, or between the roads from Shirauz to the coast, as it appeared to me they were not quite decided about them, but those they did give I have in my possession should they be required.

Village of Shewoo.

Shewoo, or commonly called by its inhabitants Sheepcoo, owing to its being at the foot of a hill, is a small fishing village situated on a small promontory of the Persian Coast, in Latitude 27° 04′ 22″ N. and Longitude 53° 08′ 51″ E. and bearing from the NW. end of the island of Sheikh Shaeb or Bushaeb N. and 11° 15′ W. and distant 14 miles.

The village comprises from 50 to 60 small square houses built of mud and stone, situated at the foot of a small hill, and round its slope is built their fort, and on the summit of which there is an oblong tower, from whence they defend their village against the frequent attacks of their hostile neighbours.

The inhabitants, hospitable and obliging people, can be numbered to about 300 souls, including men, women, and children ; out of which they can only raise 70 able men to carry arms in the defence of their Fort, to which the whole of the villagers repair for safety in time of attack.

The Fort at present is in a very dilapidated state, is built of mud and stone, with four bastions, and the tower as above mentioned.

The whole of the villagers are very poor; they carry on little or no trade with the different parts of the Gulf, having no vessels of their own, and what little they can do in trading, is in wheat brought down from the interior and embarked on board some friendly vessel that may by chance be calling there. They mostly subsist on the produce of their fisheries, by carrying them to the different inland villages, a journey sometimes of from 2 to 3 days ; men, women, and children all have their share of this work ; the men fishing and carrying home their day's labour, the women and children sorting, salting, and drying them ready for sale. The town they have the most traffic with is called Gabendy, at a distance of 3 fursacs inland from Shewoo.

The Sheikh is chosen by the villagers. Abdella Ben Ali being the present one; he is a very old man and apparently as poor as the rest of them, and is accountable to Sheikh Hassan ben Jubbareh of Gabendy, to whom he pays a yearly tribute of 150 Krans. Sheikh Hassan ben Jubbareh, who formerly resided at Congoon, has removed his residence to Gabendy, owing to the latter place being reduced to ruins by the frequent attacks of the Dashtee troops.

The present inhabitants appear to have gradually come in and settled down from different parts of the coast, as I could not gain any information as to what regular tribe they belonged to (as stated in the Selections from the Records of the Bombay Government). The oldest man amongst them, being the Sheikh, informed me that he remembered being told of one Abdul Rahaman, who came over from Nejd with a few followers, and was supposed to have been the first settler, and built the present fort. He could also show me remains of forts built by the Portuguese, but dates and records he said were not obtainable from the present settlers. The language they spoke in our presence was the Arab, but on inquiry they informed me they spoke both Persian and Arab, but they called the Arab language their mother tongue. But their manners and appearance certainly denote that of the Persian.

The neighbours they have the most dread of appear to be the seafaring men from Assaloo and its environs, whom they report as always cruising up and down the coast in search of unlawful prizes, and ready to loot any of the weaker vessels they may happen to fall in with.

This is their season to send to Nabend for their yearly supply of dates, but having only a short time ago beaten back an armed buggareh belonging to Assaloo, who had come with the intention of seizing a small Ghoncha they were loading with wheat, and owing to that they fear sending their boats or chartering any small vessel as they would be seized upon on rounding the Cape. It would appear, according to their accounts, that certain ports along that coast are at constant warfare throughout the year.

During the summer months the village of Shewoo is deserted, with the exception of 4 or 5 men left in charge of the fort, for the inhabitants repair to the interior and cultivate certain fertile grounds to be found in the valleys adjoining the chain of barren hills bordering their

coast, and return before the cold weather fairly sets in to store up their winter supplies, and carry on their fishing trade.

(Signed) H. W. WARNER,
Commanding Residency Schooner "Georgiana."

Bushire, dated 30th October 1863.

(True copy)

(Signed) LEWIS PELLY, Lieutenant-Colonel,
Acting Political Resident and
Consul General, Persian Gulf.

ART IX.—*On a supposed effect of the Humidity derived from the Cistern of the Wet Bulb Thermometer upon the reading of an adjacent Dry Bulb.*—By JOHN ALLAN BROUN, Esq., *F.R.S.*

[Read before the Society, January 21st, 1864.]

THIS effect Professor Orlebar deduced from his observations in 1845 (see Introduction to the volume of Bombay Observations for 1845, p. lxx.), and his conclusion, with some of the numbers upon which it depended, were cited by Colonel Sykes in his paper on Indian Observations, in the Transactions of the Royal Society of London (1850, p. 337), as an illustration of an additional source of error in attempting to compute vapour pressures from the psychrometer. It was also cited by other writers.

Professor Orlebar, in comparing readings of a standard thermometer with those of the dry bulb thermometer (the latter on the same stand with the wet bulb and its cistern), found differences amounting in one case to 11·2 deg., and in four cases from 3 deg. to 7 deg. Faht. He came in consequence to the following conclusion :—

"Although great allowance must evidently be made for error of observation, yet these observations clearly show that the dry bulb was depressed below its proper height, and that this depression is greater as the depression of the wet below the standard is greater. This seems accountable only on the supposition that heat is extracted from the air to form the shell of moisture round the wet bulb at a distance as far off as the dry bulb. Hence I consider the observations of the dry bulb as quite useless and have not published them."

Several years ago I had the curiosity to endeavour to discover the source of what I could not help believing to be an erroneous conclusion. I found, upon examining the volume of Bombay Observations for 1845, that the observations made according to the hours of Göttingen Mean Time (as usual in the Magnetic Observatories) had probably also the corresponding hours of Bombay Mean Time noted. Professor Orlebar

had, in the four cases alluded to, compared the reading of the standard thermometer for Göttingen hours with the dry bulb readings at the homonymous Bombay hours. Thus the standard thermometer read 82·4 deg. on November 3rd, 19h. *Göttingen* Mean Time, the corresponding Bombay mean time being November 3rd, 23h. 12m.; this reading had been compared with the dry bulb reading of 75·4 deg. on November 3rd, 19h. 12m. of *Bombay* Mean Time: the two observations compared having been made at an interval of four hours.

In all the other cases cited by Professor Orlebar, the differences of the readings of the two dry bulb thermometers were slight, and there was in these cases no error with reference to time: the great difference of 11·2 deg. was due to the wet bulb reading having been taken by mistake for the dry bulb reading.

As I have seen no correction of this error, it seems to me desirable now to point it out and its source, in order that it may not be allowed to increase the numerous imperfections of elementary works on meteorology.

ART. X.—*On an effect of the Atmosphere upon the Magnetic Intensity of the Earth, supposed to be found in the Bombay Magnetic Observations, from* 1847 *to* 1862.—By JOHN ALLAN BROUN, Esq., *F.R.S.*

[Read before the Society, January 21st, 1864.]

THE conclusion that such an effect existed, appeared first in the Bombay Observations for the year 1847 (p. 479), where a reference is made to the introduction to the volume for the evidence; this, however, I have found only in the introduction to the volume for 1848 (pp. xxii, xxiii, and xxiv). Corrections and discussions have been based on this result in fifteen successive volumes, in every one of which it has been re-asserted. If true, it would be a fact of very great importance, and the grounds upon which the discovery is based merit careful consideration.

The conclusion is thus stated by Captain Montriou in the volume for 1847 (p. 472) :—"To cause the above observed effect, it was supposed that the air surrounding the Magnetic Observatory was magnetic, and that its moment altered with the changes of its *temperature*; consequently, this *air* affecting the needle of the Horizontal Force Magnetometer, in addition to the magnetic force of the earth, caused the observed phenomenon. The magnetism in air may have been induced by the earth; but whatever be the cause, the effect of the air was certainly felt, and it was necessary that it should be removed (considering it as a local cause) to obtain the true changes of the earth's magnetism."

The following are the grounds upon which the result appears to depend:—Three tables have been formed: in the first the *monthly* mean values for 1847 of the bifilar scale readings, corrected for the effect of temperature upon the magnet as shown by a thermometer in the same box is compared with the monthly mean temperature shown by the box (or attached) thermometer, and by a thermometer placed three feet above the ground outside the Observatory; in the second table similar comparisons are made of the *even hourly* means for 1847;

in the third the quantities compared are the monthly mean diurnal *ranges*.

An inspection of all three tables shows, that when the temperature increases the bifilar readings also increase. As the monthly mean temperature within the box varies nearly as much as the monthly mean temperature outside the Observatory three feet above the ground, the comparison indicated gives nearly the same number of divisions of the bifilar scale for a change of 1° Fahr. in both instances; or increases of 1° Fahr. within the box, and outside the Observatory are respectively equivalent to increases of 1·17 and 0·91 *small* scale divisions of the bifilar reading. These values give no information as to which temperature they are due, and an appeal is made to the second table, where the two hourly variations of temperature within the box are only about half of those outside the Observatory: this table seems to show that, for increases of 1° Fahr. the variations of bifilar reading are 2·78 and 1·19 small scale divisions respectively; and a further reference to the third table, where a similar difference exists for the temperature variations, gives 3·01 and 1·55 scale divisions respectively.*

It was concluded:—"From this it is evident that the near agreement of the values under the head of circumambient air (*i. e.* external temperature) and the wide difference of the values under the head of attached thermometer, sufficiently proves that the effects of temperature on the horizontal intensity are due only to the circumambient air."— Introduction 1848, p. xxiv.

I think that there is no foundation for this conclusion, and that it is easy, from the data in the Bombay Observations themselves, to explain these co-efficients, without any hypothesis as to the circumambient air.

It is a well known fact, that the position of the bifilar magnet depends upon its temperature in such a way, that when the temperature *increases* the scale readings *decrease* or *seem* to show a *decrease* of the earth's magnetic force. In the tables employed by Captain Montriou for this discussion, a correction *had* been already applied on this account; the correction employed by him being 3·2 small scale divisions for 1°

* These are the quantities properly deducible from the three tables (when some small errors are corrected), but they differ slightly from those obtained by Captain Montriou.

Fahr. But in the subsequent volumes the temperature co-efficient is stated to be only 2·0 scale divisions; so that on this authority alone the quantities for 1847, which were discussed, were *over* corrected by a co-efficient of 1·2 scale divisions. As the result of an over correction is to cause the bifilar readings to *increase* with *increasing* temperature, we see at once why the three tables employed show an *apparent* relation betwixt increase of temperature and an increase of the earth's magnetic force.

It was assumed that the correction for the temperature of the magnet was accurate, whereas the introduction to the volume itself showed that the correction could not be depended on (Introduction 1848, p. xvi.), and subsequent volumes proved it to be altogether erroneous. So far the tables are quite untrustworthy for any deductions.

In the next place, it was also assumed that the earth's magnetic force did not vary in any degree similarly with the variation of the temperature of the air; indeed, it was assumed that the former scarcely varied at all, but that the annual and diurnal variations were chiefly due to the varying temperature of the air three feet above the ground, and upon these hypotheses the co-efficient for the "circumambient air" was deduced.

It must however be evident, that if the annual or diurnal laws of the magnetic force were in any degree similar to those of atmospheric temperature, it would be hasty to assume that the one was in any degree a cause of the other. For example, in India the horizontal magnetic force increases from the morning till 11 A.M. or noon, and then decreases till near midnight; this is somewhat like the law of the temperature variation, but it would be opposed to all sound induction to assume on this ground alone, that the increase of bifilar scale reading till 11 A. M. was due to the increase of temperature till the same hour. And this not merely because the bifilar reading diminishes till 1 or 2 P. M., while the temperature is still rising, but also and particularly because the temperature law is similar for all latitudes and seasons, whereas the bifilar law varies with both season and latitude. In Europe the *minimum* horizontal magnetic force occurs near 10 A. M.,—nearly the hour of the maximum in India.

If then the diurnal variation of the bifilar in India, even after an *accurate* correction for the effect of temperature upon the magnet, were

compared with the diurnal variation of the temperature of the air within or without the observatory, an apparent relation would be found to exist (just the *opposite* of what would be found in Europe) and a co-efficient might be deduced which would be so much the smaller, the larger the temperature variation, so that the co-efficient for the greater variations of external temperature would be less than that for the small variations af internal temperature as Captain Montriou found.* But that there should have been any tendency to similarity in the result from the three tables was quite accidental, and due in that instance to the previous erroneous correction for the temperature of the magnet.†

An evident method of determining whether the temperature of the external atmosphere has any effect upon the bifilar readings independently of its effect in heating the magnet, is to heat artificially the room containing the magnetometer, so that when the temperature of the external air is falling, that of the magnet may be rising, since an increase of temperature of the magnet causes a *diminution* of the scale reading. If the increasing temperature of the external air caused an *increase* of scale reading (as Captain Montriou supposed), the reading would change by the difference of the two effects, but if the temperature of the external air diminished, while that of the magnet increased, the change (according to the same supposition) would be equivalent to the *sum* of the two effects. Such comparisons by artificial heating were made by me in 1843, and the conclusion was, that the effect on the scale reading was due wholly to the temperature of the magnet, and was quite the same whether the external temperature increased or diminished.‡

There was still another assumption in connection with the result from the Bombay Observations which merits notice. The hourly variations of temperature of the circumambient air were assumed to be shown by a

* The same remark applies to the result derived from the third table of diurnal ranges.

† In subsequent volumes of Observations it is merely stated that this correction has been verified from subsequent years' observations, but it may be safely asserted that the agreement of results from the three tables could not be the same whatever temperature co-efficient was employed.

‡ Makerstoun Observations. Transactions Royal Society Edinburgh, Vol. XVIII. page xlviii. Any difference must have been quite of a second order and not appreciable in the discussions.

thermometer placed three feet above the ground, whereas it is not improbable that the variations of temperature of the mass of the shell of air likely to act influentially (if it acted at all) would have been nearly as well represented by the thermometer in the box as by that outside.

The approximate value for the temperature co-efficient of the bifilar magnetometer for 1847 has been obtained by me approximately (1·58 scale divisions, about *half* of that employed in the Bombay volumes for 1847 and 1848) having corrected the Monthly Means (as obtained by me from the table of Daily Means, p. 459, 1847) and allowed for an increase of reading at Bombay at the rate of 0·8 small scale divisions monthly, I have found the following quantities, which are placed alongside of corresponding means for the same year, deduced by me in a similar manner from the bifilar observations at Hobarton, Van Dieman's Island:—

Variations of Bifilar Monthly Means.

1847	Hobarton. sc. div.	Bombay. sc. div.
January	7·29	6·13
February	3·95	3·26
March	2·12	0·54
April	0·00	0·00
May	3·73	2·16
June	7·51	5·54
July	6·55	5·10
August	5·79	4·91
September	1·02	2·12
October	2·19	1·01
November	3·91	4·03
December	4·51	2·92

These quantities (where the unit is one ten thousandth [$\frac{1}{10000}$] of the horizontal force at the respective places) agree pretty well, considering that the determination of the unit co-efficient depends at both places upon the torsion circle, a method which I have found to be frequently inaccurate, and that there may be errors at both places which I have no means of correcting.

I have felt more reason for a careful examination of the erroneous result as to the magnetic effect of the atmosphere, that I believe it in some degree attributable to conclusions arrived at by myself.

In 1842 I first proposed to determine the temperature co-efficient, from the usual observations, by a method which was published first in the Edinburgh Transactions for 1845, and at a Meeting of the British Association at Cambridge in the same year. My method was met at the meeting by an objection from the Astronomer Royal that it assumed that the magnet was affected only by its own temperature, and not by the temperature of the air or of the soil. As my method gave a very different co-efficient from that derived by the usual method, the conclusion might have been easily accepted that the air *had* an effect, and that the difference of the co-efficients found by the two methods was due to this cause. And as the old method was continued by every one, excepting myself, till very recently, there was some ground for believing that the conclusion was generally accepted.

I stated in reply to the Astronomer Royal, that I had made the experiments already referred to with artificial heat, proving that the external temperature had nothing to do with the co-efficient, and I noticed as a probable cause of the difference, the effect of heat on the torsion force of the suspending wires. My researches since then have shown this cause to be probably the true one : the difference also by the two methods is variable with the instrument, that is to say, with the twist of the particular wires, and it has been found in one case to be nothing.*

I may notice, in conclusion, another result of the Bombay Observations which appears in the introduction to several volumes, namely, a supposed effect of solar white light upon the Balance needle. (See Bombay Observations for 1845, Introduction p. iv.) Professor Orlebar found the moonlight had no effect, but it was found that lamplight had a similar effect to solar light though to a less degree. (Bombay Observations 1847, Introduction p. xxvi.) It is only necessary to say that the effects observed were chiefly due to currents of air generated by the heat rays from the sun and lamp, which could not have been perceived had the needle been in a vacuum : the non-effect of the moonlight is thus quite explicable.

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* So Dr. Lloyd has informed me in the case of the Dublin bifilar.

ART. XI.—*Account of a Cyclone experienced by the Government of India Steam Ship "Amberwitch" near the Mauritius, January* 1864. *By* A.W. STIFFE, *late Lieutenant H. M.'s Indian Navy. Assoc. Inst. C.E., F.R.A.S.*

[Read before the Society, March 17th, 1864.]

A DESCRIPTION of this storm will, I think, have some interest, from its happening within the limits of which Mr. Piddington (page 39, Hornbook, third edition, 1860) speaks as follows:—"It will be seen on the chart that there is a blank space between the meridians of 40° and 55° East, and between the parallels of 30° and 40° South, in which we have as yet no data for the tracks, and where they may be highly uncertain," &c. I will first give an extract from my private log, and then offer such remarks as have occurred to me on the subject, premising only that the "Amberwitch" is a screw steamer with auxiliary power only, and unable to steam against (gross tonnage 550 tons, horse power 70) even a fresh breeze. The barometer is an ordinary marine barometer, which I had compared with the standard at the Cape Observatory, and ascertained to have an error of 0·07 inches, which has been applied to the readings. *The bearings and courses are true,* or corrected for variation. On the 24th and 25th January strong winds from East to NE. by E. standing to SE. under fore and aft sail; weather cloudy. Barometer 30·30 to 30·23 or higher than the average. On the latter day at noon lat. 32·58½ S. long. 40° 46' E. from which position the copy of the meteorological register (attached) commences.

January 1864. *Government of India Steam Ship "Amberwitch," Lieutenant*

Date.		Wind's Force, Direction.		Weather. State.		Clouds.	Barometer. Corrected for Barr. Index error.	Thr.
Mon. 25th.	4	NE by E	6	b c m	1/8	cirri str.	30·17	77
	10 P. M.	,,	5	b c	5/8	cum. cum. str.	·23	76
Tues. 26th.	4 A. M.	Variable to ENE	2	b c w	3/8	cum. cum. str.	·21	74
	10	NNE	1 to 2	b c	2/8	cirri cirri. str.	·23	77
	4 P. M.	ENE	2	b c	3/8	cirri cum. on hor.	·22	75
	10	,,	2 to 3	b c w	4/8	cum.	·29	76
	12	,,	3 to 5	b c p q	..		.	
Wed. 27th.	4 A. M.	,,	2 to 3	b v w	..	.....	·26	76
	10	,,	2 to 5	b c m q	3/8	cum. cirri. cum str.	·26	77
	12	..	..	p	..	.....	..	..
	4 P. M.	NE by E	4	b c m	4/8	cirri cum. on hor. cirri str.	·22	77
	10	,,	3	b c w	1/8	.....	·24	76
Thurs. 28th.	4 A. M.	,,	3	b c w	5/8	cirri str. cum. clouds passing to W.	·15	74
	10	,,	2 to 3	b c	3/8	do. do.	·17	78
	4 P. M.	,,	,,	,,	3/8	cum. cirri str.	·12	75
	10	,,	3	,,	6/8	cum.cum.str.nimbi	·15	77
Fri. 29th.	4 A. M.	ENE	2	,,	6/8	nimbi cum. str. cirri str.	·13	76
	5	E by S	3	,,	..	.....	..	..
	10	,,	4	b c w	7/8	.....	·09	76
	1 P. M.	,,	7 to 8	o p g q	8/8	nimbi; sky densely overcast.	·02	..

A. W. STIFFE, *H.M.'s Indian Navy; Cape of Good Hope towards Mauritius.*

Temperature.										Remarks.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.					The "Run" given at noon is the actual distance made good by observation in nautical miles. All bearings and courses have been corrected for variation.
	Dry.	Wet.			Surf.	10	20	30.	Bottom.	
76	76	72	..	..	75	..	..	..	..	Standing to ESE. under fore and aft sails.
75	75	71	..	..	..	..	..	..	..	
74	74	71	..	..	..	..	..	..	..	At 4*h.* 0*m.*—All sail and stood East; heavy Easterly swell.
76	75½	72	..	..	..	..	..	..	..	*Noon.*—Lat. 33° 16′ S. Long. 43° 7½′ E. Run 125′. Coal expended 9 tons 13 cwts. At noon altered course to ENE.
73	73	71	..	..	..	..	..	..	..	*Sunset.*—Heavy electric cumuli on South horizon, passing to Westward; heavy dew falling; showers of short duration.
75	75	72	..	..	..	..	..	..	..	
75	75	73	..	..	..	..	..	..	..	Standing ENE. Heavy masses of clouds passing in opposite directions.
75	75	73	..	..	..	..	..	..	..	*Noon.*—Lat. 32° 31′ S. Long. 44° 56¼′ E. Run 102. Coal 10 tons. Current to Westward. 15 in 24 hours. Moderate Easterly swell.
..	..	..	..	..	..	..	..	..	..	
75	75	72	..	..	..	..	..	..	..	*Sunset.*—Heavy cumuli passing from Eastward. Down top-gallant yards.
75	75	71	..	..	..	..	..	..	..	
74	74	70	..	..	..	..	..	..	..	Standing NE. by E. ½ E. Moderate Easterly swell.
78	77	72	..	..	..	..	..	..	..	*Noon.*—Lat. 31° 58¾′ S. Long. 46°37¾′ E. Run 91. Coal expended 9 tons 1 cwt. Current West 10°. At noon altered course to NE. by E.
74½	74½	71½	..	..	..	..	..	..	..	
76	76	73	..	..	..	..	..	..	..	
75	75	72	..	..	75	..	..	..	..	5*h.*—Set fore and aft sail and stood NNE. Threatening appearance to NE. and East.
..	..	..	..	..	..	..	..	..	..	
75½	75½	73	..	..	..	..	..	..	..	10*h.*—Increasing breeze and sea. Preparing for bad weather.
..	..	..	..	..	..	..	..	..	..	*Noon.*—No observations; Lat. acct. 31°. Long. acct. 47° 50′. Coal expended 9 tons.
										2*h.*—High regular sea; unbent outer jib and main-sail.

January 1864. *Government of India Steam Ship "Amherwitch," Lieutenant*

Date.		Wind's Force. Direction.		Weather. State.		Weather. Clouds.	Barometer. Corrected for Barr. Index error.	Barometer. Thr.
Fri. 29th..	4 P. M.	E by S	8	o p g q	8/8	Nimbi, sky densely overcast.	30·01	75
	6	East	9	o u q p	,,	,,	29·98	..
	8	,,	,,	,,	,,	,,	30·03	..
	10	,,	,,	....	..	.....	·01	75
	12	E by S	9 to 10	o r q u	,,	Nimbi, sky densely overcast. At sunset gleam of sunlight through broken clouds. Thick and densely overcast all night.	29·04 Bar. rising and falling at intervals.	..
Sat. 30th..	2 A. M.	,,	9	o r q u	,,	nimbi. poured with rain.	·88	..
	4	,,	7	,,	,,	,,	·83	76
		SE	3 to 6					
	6	E by N	8 to 9	,,	,,	,,	·79	..
	8	ENE	8	....	..	At 9-30 nimbi and scud flying past, upper stratum to Southward, lower to Westward.	·77	
	9½						·74	
	10	NNE	7 to 8	b c p q	..	.....	·77	76

A. W. STIFFE, *H. M.'s Indian Navy*; *Cape of Good Hope towards Mauritius.*

Temperature.										Remarks.
Air.	Wet Bulb.		Max. & Min.	Sun.	Sea.					The "Run" given at noon is the actual distance made good by observation in nautical miles. All bearings and courses have been corrected for variation.
	Dry.	Wet.			Surf.	10	20	30	Bottom.	
74½	74½	73	..	..	..	..	..	..	..	6*h.*—Increasing gale; vessel pitching heavily. Believing we are running into a Cyclone, tacked and stood to Southward.
..	..	..	..	..	..	..	..	..	..	8*h.*—Heavy gale with gusts, and drizzling rain; high sea; vessel lurching violently. Under fore and main-try-sails and fore-stay sail.
..	..	..	..	..	..	..	..	..	..	
74½	74	73	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	..	10*h.*—Increasing gale and high sea, but tolerably regular; furious gusts. From noon to 6 P. M., steered NNE. 27′ (approx.) From 6 P.M. up to 8*h.* on Saturday morning made about South 48′ when we hove to. After midnight wind moderating; vessel lurching awfully in the trough of the sea.
..	..	..	..	..	..	..	..	..	..	6*h.*—Gale came on again at E. by N. after lulling at 5*h.* to a moderate breeze, and veering to SE.
75	75	73	..	..	..	..	..	..	..	8*h.*—Hove to on port tack, under reefed mizen, fore and main try-sails and fore-stays. High cross sea; vessel easy. 9*h.* 30*m.*—Clouds breaking, got sights. 10*h.*—Wind veering to Northward. Set close reefed top-sails, but did not set on the engine, as she has come up into a heavy Easterly sea; blue sky overhead; the body of the storm visible to Westward as a wall of black clouds with a heavy white bank above it. At the point where I suppose the centre to be, the wall is of lighter hue. Strong breeze NNE. to N. Steering E. by N. making about 2′ per hour. While hove to, drift to SW. or West 1′5″ per hour. *Noon.*—Lat. obs. 31° 18½′S. Long 48°34 E. Run since Noon on Thursday 107. Coal expended 6 tons. Made sail to top-sails, inner jib, &c.
..	..	..	..	..	..	..	..	..	..	
(the minimum reading).					..	..	..	..	..	
77	77	76	..	..	..	..	..	..	..	

January 1864. *Government of India Steam Ship "Amberwitch," Lieutenant*

Date.		Wind's Force. Direction.		Weather. State.		Weather. Clouds.	Barometer. Barr.	Barometer. Thr.
Sat. 30th..	12	NNW	6 to 7	b c	2/8	cirri str. scud passing to South.	29·82	..
	2	NW by N	6	b c	1/8	cirri str.; scud passing to South	·84	..
	4	NNW	6	b c	3/8	nimbi on horizon,	·84	76
	7	,,	..	..	..	banks to E. to W.	·88	..
	10 P. M.	,,	5 to 6	b c q l to Ed.	3/8	cum. str. passing from N.	·93	77
Sun. 31st..	4 A. M.	NNW	4 to 5	c g w	7/8	cum. str. nimbi.	·95	76
	10	NW by N	5	b c	2/8	cirri. str. on horizon, heavy clouds to E.	30·06	75
	12							
	4 P. M.	,,	4	b c g w	7/8	cirr. cirr. str. cum. str. bank of heavy clouds to E.	·12	76
	10	Calm	0	o w.	8/8	nimbi cum. str.	·28	78
	12 to 2.	.....	..	o r	8/8	nimbi.	..	..

A. W. STIFFE, *H. M.'s Indian Navy*; *Cape of Good Hope towards Mauritius.*

Temperature.										Remarks.
Air.	Wet Bulb.		Max & Min.	Sun.	Sea.					The "Run" given at noon is the actual distance made good by observation in nautical miles. All bearings and courses have been corrected for variation.
	Dry.	Wet.			Surf.	10	20	30	Bottom.	
..	..	..	..	..	..	..	..	..	..	Fine strong breeze at N. by E. to N. by W.; clear sky.
..	..	..	..	..	..	..	..	..	..	2*h.* 15*m.*—Set on with the engine; heavy Easterly sea. All plain sail except top-gallant sails and outer-jib.
76	76	74	..	..	..	..	..	..	..	*Sunset.*—(Estimated run from the edge of the storm 50 miles). A few cirri.
..	..	..	..	..	..	..	..	..	..	and cirr. str. to Eastward. To the
76	76	75	..	..	..	..	..	..	..	Westward the cyclone distinctly visible as a great wall or bank of dark clouds, extending from NW. by N. to South, slightly convex on the top. Elevation of highest part above horizon 2½°. The sun set into this just as it would behind a mountain mass. The appearance of the sun also peculiar bright and flashing at the edges, the centre a sort of pale blue.
										10*h.*—Cloudy; squalls from Northward, arched clouds passing over from NW. To Eastward a bank of clouds on horizon, with vivid lightning working round the horizon to Southward. In 1st reefs of top-sails.
										Midnight cloudy, with squalls; confused Easterly swell.
75	76	76	..	..	..	..	..	..	..	Lightning to E. and SE. all the middle watch. Out reefs and set top-gallant sails.
74	74	74	..	..	..	..	..	..	..	9*h.*—Mist drove past for 15*m.* wetting everything; afterwards weather clear; confused heavy swell.
										Noon.—Lat. 30° 43½′ S. Long. 50° 50¾ E. Run 122. Coal expended 5 tons 11 cwt. In all sail. Heavy rain from midnight to 2 A. M.
75	75	74	..	..	..	..	..	..	..	*Monday.*—Fine, and high Barometer; wind North; swell decreasing.
77	77	76	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	..	

Remarks on the above Register.

January 25th to 28th.—The continuance of Easterly winds for so many days was very perplexing. At one time it appeared as if the trade must have extended Southward to a most unusual extent. The rapid motion of the clouds overhead for some time previous indicated some disturbance, but the Barometer was not affected. On the morning of Friday, the 29th January, the appearance of the weather was very threatening, the Barometer had fallen slightly; and I considered it possible a cyclone might be approaching, and made in consequence preparations for bad weather.

As the ship was lying her course under fore and aft sail, and the Barometer was so slightly affected, stood on to NE., carefully watching the weather.

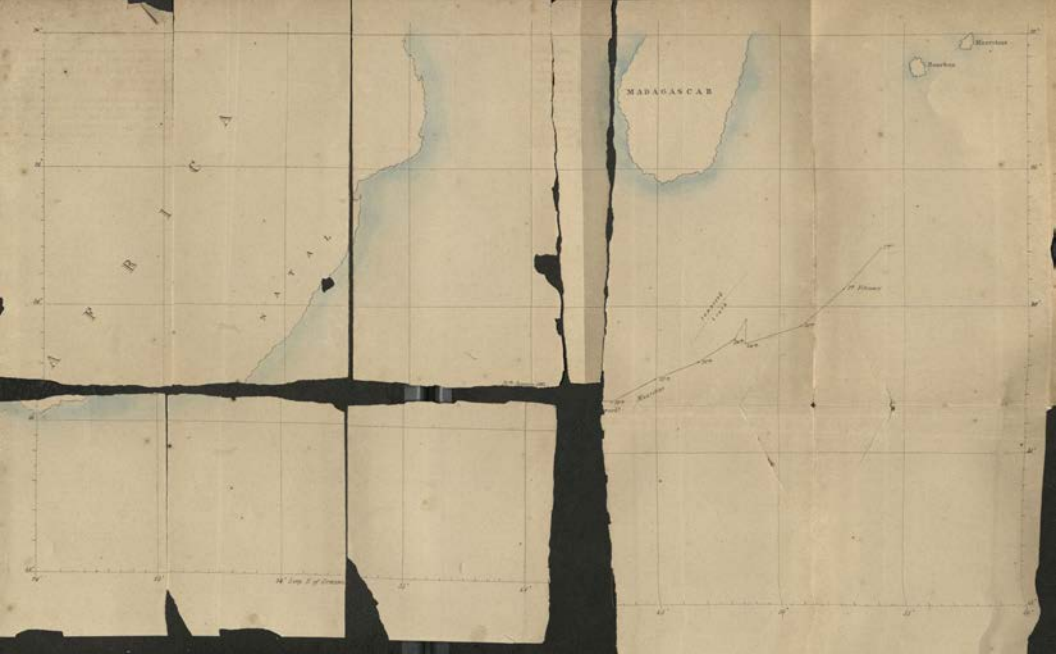
By 6 P. M. the glass had fallen considerably, the wind and sea increasing rapidly, and the weather thicker, leaving no doubt on my mind of the vicinity of a cyclone.

The centre was now bearing true North from us, and it became an anxious question what should be done, from the uncertainty whether the storm was pursuing its normal track to WSW. or whether it was reveering to South or SSE. In the former case the obvious plan would have been to heave to, till the centre had passed; in the latter, to run to NW. and attempt to cross in front of it, as the centre would be coming directly towards us.

29th January, sunset.—After some hesitation I decided to stand to the SSE. under fore and aft sail, and to watch any indication of the direction of the track.

Midnight.—The gale and sea increased towards midnight to a force estimated at 9 to 10, and the Barometer fell further, though slightly; also oscillating in a remarkable manner, to the extent of about 0·05 apart from the pumping motion attributable to the lurching of the vessel. The weather was exceedingly thick, and it rained incessantly, although doubtless the clouds were in rapid motion: they appeared to form such a solid mass, as to render it impossible to observe it, and seemed stationary over our heads.

30th January A.M.—Up to this time there was no indication by the wind veering, that the centre was not following us: and at daylight


MADAGASCAR
Mauritius
Bourbon

when the wind fell light and veered for a short time to SE., I felt sure it was passing to the Eastward of us. However, before I could quite make up my mind, it veered again to East, and blew as hard as ever for a short time, veering to E. by N. and at 8*h*. to ENE., the glass falling rapidly since midnight.

I, now feeling certain the centre was passing to the Westward of us, hove to at 8*h*. A. M. on the port tack, to allow it to pass, being in the "left hand semicircle." (Colonel Reid's Rules.) At 9*h*. 30*m*. the clouds began to break, and the sun became visible, at times, showing the scud rushing across it with great rapidity, the Barometer at this time reached its greatest depression and began to rise. At 10 the wind had veered to NE., by E. and we regularly emerged from the edge of the storm into sunshine, so rapidly did it clear. Broken masses of clouds were now flying in different directions, and the body of the storm was distinctly visible as a wall of dark cloud apparently close to the Westward of us.

The weather rapidly improved, and at noon moderated to a fresh breeze at North to NNW.

A heavy confused sea, as might be expected, was experienced both on this day and the following.

The appearance of the bank of clouds containing the storm at sunset, when we had run 50 miles to Eastward, and the storm perhaps as much more to the Westward, was extraordinary and instructive, for a ship going the opposite way, and in danger of overtaking the storm.

The lightning seen on the Eastern horizon during the night of the 30th was the only electrical display seen.

The accompanying plan shows the ship's position on each day at noon, also the probable track of the cyclone as I estimated it:—

At the Mauritius we found no bad weather had occurred at that date, only slight depression of the barometer. The storm would therefore appear to have been local, or to have originated Southward of the Mauritius.

Art. XII.—*Report on the line of Telegraph from Ras Jashk to Basrah.* *By Lieutenant* A. W. Stiffe, *Indian Navy.*

[Read before the Society, March 17th, 1864.]

The annexed plans show exactly the best routes for the cable, with the bearings and lengths of the short straight pieces of which it is made up, the table giving an abstract of the same, and the total length of cable.

Excepting a distance of 105 miles between Faú and a point 15 miles SW. of Khareg island, the whole extent of the cable can be accurately intersected by angles 2, 3, or 4 shore objects, when the weather is clear.

Jashk to Musendom.—The cable would pass Ras Jashk at 2 miles distance in 50 fathoms soft green mud. As there is only half a mile between 18 and 55 fathoms, it would be desirable here for a Pilot ship to take up a position in advance, on the edge of the shoal-water. From Ras Jashk it should take a course, as shown on the plan, to Ghubbet Gazireh, the object of the slight detour being to avoid the shoal-water to the Westward of Jashk; a Pilot vessel would be desirable at the salient angle. It would then pass, as shown, very near Ras al Kuh to avoid crossing the deep water lying close off that point.

Nature of Bottom.—The bottom continues the same soft, green mud, till 14 miles from the entrance of Ghubbet Gazireh, when it becomes hard and somewhat uneven; the water however is deep, and the tidal current weak, so that I do not apprehend any bad effect. The cable should make a course a little to the Southward of the straight line to Ras al Kuh (on leaving the inlet) until past this hard ground. It would pass up the centre of the inlet, where the depths decrease from 33 to 20 fathoms; the bottom being soft green mud and very level, and be landed at the small bay or bight shown on the separate plan of the inlet.

Size of Cable.—As none but the smallest boats (we saw none in either inlet over 5 tons burden) frequent this inlet, and as the landing place

is quite land-locked, I imagine the 6-ton cable would be quite sufficient for the whole of the part within the inlet. I should indeed prefer using the 3-ton size, keeping the 6-ton part for the rocky ground outside the entrance.

Tides.—The tides off Ras al Kuh and the inlet were observed at conjunction (the moon being in perigee), and off the former place, found not to exceed 1½ knots, and off the latter, only one knot, being much less than I had anticipated; the rise and fall by tide guage in Ghubbet Gazireh was 10 feet; high-water at full and change 9*h*. 30*m*.

Landing place.—The landing place is a small bight at the foot of a ravine, and although rocky above high-water mark, has a fine sandy bottom below, as could be plainly seen to a depth of 4 fathoms, the slope being very steep to the deep water and muddy bottom of the inlet at most a cable's length off.

The little fishing villages in this inlet, and in that on the opposite side, are inhabited by a very harmless race of Arabs, who are exceedingly poor. They are chiefly of the Shaihin tribe.

Station on Musendom.—With reference to the station on Musendom, or more correctly the Ruweis al Jebál, I have been guided by the following considerations: salubrity of site, proximity to supplies,—particularly water,—proximity to the site selected for the wire to cross the Isthmus separating Ghubbet Gazireh and Khor as Shem.

Spot at which the Wire should cross the Isthmus.—There cannot be any doubt as to the best place for the cable to cross the Isthmus. The point shown on the plan is unexceptionable in every respect. It is nearer the mouth of both inlets than any other suitable place, is only a third of a mile in width, and 280 feet high. On both sides there are equal facilities for landing the cable, and carrying a land line up to the summit. Space also sufficient for the small building required near the water.

Site for Station.—The most eligible spot in the vicinity of the land line is a plateau marked on the plan, which is elevated 500 feet above the sea, and is sufficiently accessible and extensive; it is also the highest point available, the higher mountains in the vicinity being mere ridges without any level space on top. There is no water here, and (until at least reservoirs should have been made) it

would have to be brought from Khasab, about 6 miles distant; neither are any supplies obtainable.

Objections to this site.—The greatest objection to this site is doubtless its land-locked position, being so much shut in from the "Shemal" (the prevailing wind) by higher mountains near Khasab, and by the great peak called Jebel Shem. The heat during the summer months would from this cause I fear be insupportable.

Proposed to have the Repeating Station quite distinct.—Mr. Greener informs me, it is not in his opinion a *sine quâ non*, that the station should be at the Isthmus, but that the cable could be landed a second time at the station, working through the short land line at the former place. If this be considered unobjectionable, the projecting promontory called Ras as Sheikh offers considerable advantages. It rises in a gradual slope from its Northern extreme, to a height of over 2,000 feet, and the crest of the ridge is quite open to the "Shemal," which here blows WSW., the question of height above the sea being limited practically only by the difficulty of transporting supplies. An ample supply of excellent water is obtainable at a short distance. Khasab, whence the supplies would have to be obtained, is only 3 miles off. Khasab Bay being sheltered from the prevailing winds, the land line on the Isthmus could be visited at any time in an open boat, distance by sea 8 miles. The spot selected by us seems to be an eligible one. It is about half a mile above the village of Al Haraf, and about 1,000 feet above the sea (*see Plan*), and is sufficiently elevated and open to the sea breeze, without being inconveniently far from the wells, &c.

Wells.—The wells whence the Al Haraf people get their water are in a small cove called Eideh, at the bottom of a ravine running down from the village, and distant about a mile. It lies on the seaward face of the promontory, and the water is excellent; we were assured the supply was never exhausted, or the water brackish. The foot path from the village to it is very practicable, even at present. There are wells of equally good water also at Al Hanch the place next mentioned.

Cable to be landed at Al Hanch Cove.—The small cove at Al Hanch affords a smooth landing place for the cable; it has a fine sandy beach, with a large grove of date and other trees, and, as above stated, good

water. None but very small fishing boats visit it. The path up the hill hence to Al Haraf is very rugged at present, although the Arabs manage to carry up sacks of dates; we traversed it in 30 minutes. No attempt has been made to improve it in any way, and I think a good footpath might be made at a moderate expense. From Ras as Sheikh a carriage road might be made up the long slope with ease; the little sandy bays at the Northern tip of the promontory affords good landing only in moderate weather. The distance from Al Hanch to Khasab is 2¼ miles, and can always be traversed in a small boat.

Line from Al Hanch to the Isthmus.—The cable, on leaving Hanch Cove, would be carried back side by side with the other, making a circuit, as shown, to avoid the anchoring ground in Khasab Bay, crossing that bay in 20 to 24 fathoms, and thence up Khor as Shem (least depth in the entrance 14 fathoms, deepening inside to 16 fathoms) to the landing place on the Isthmus, as shown. The two ends should, so far as they lie side by side on leaving Al Hanch Cove, be I think 'married' or fastened together, and laid simultaneously, to give greater strength in the event of being fouled, and also to reduce the chances of such an accident.

Buoys in Khor as Shem.—The narrow entrance to Khor as Shem must be buoyed temporarily to ensure the cable being laid in the deepest water: such a set of buoys, say water casks painted red for port, and green for starboard, could be laid down in a day, or a number of boats anchored. The bottom across Khasab Bay is fine sand, at the entrance of the inlet it is hard, and afterwards all mud, until quite close to the landing place.

Size of Cable.—I do not think anything larger than the 6-ton cable would be required, and this should be carried to a point 2 miles North of Ras as Sheikh.

Supplies.—Khasab has plenty of good water, owing to its situation at the mouth of the largest valley in the Ruweis al Jebál, there is a very extensive date grove; some vegetables are grown, also corn, &c. If there were a demand, any quantity of these latter could be raised. Sheep and cattle, poultry, eggs, butter, milk, &c., are procurable. I do not in the least doubt that the question of supplies will offer no difficulty. There are plenty of men, as at Basidah, and other places

accustomed to supplying the English, who would establish themselves at Khasab at once.

Access to the Mountains.—This place also seems to afford the easiest access to the great mountains, indeed the people offered to take us to the highest point in a day.

Land-line.—If it were wished to avoid the second landing, a land-line might, I think, be taken by a very circuitous route from the station on Ras as Sheikh to the Isthmus. Mr. Greener however considers it would be impossible to maintain it in working order.

Building materials.—The limestone, of which all these hills are composed, is a good building stone, it splits readily into rectangular masses. The natives build their huts of the naturally squared blocks, found plentifully on all sides, without any mortar.

Date tree trunks, split into 2 or 3 pieces, are the usual, indeed almost the only, rafters or beams used in the country; we were informed at Khasab that a large supply could be obtained there at 1 Keran (say shilling) for each trunk or pair of beams. The mortar used at Khasab is bad, but the people stated that better could be made if required.

Temporary Wooden Barracks—I would submit, whether it might not be better in the first instance to send out jointed wooden Barracks from England; they could be erected without loss of time on any particular site preferred by the officer in charge of the expedition, and should it eventually be found desirable to change the position, could be moved at a small expense. Their freight out would not be considerable, and they would always be useful afterwards. (They might be sent out in a coal ship). Of the wooden Barracks made in Bombay for the Persian War, none are at present on hand there.

Permanent Buildings.—For the permanent erections, I think buildings of two stories are highly desirable, to avoid the great heat reverberated or radiated from the dark rocky ground, which must become intensely heated in summer.

The ground being every where rock, little preparation in the way of foundation would be needed.

The style of house well adapted for the climate would be the flat-roofed house of the country, with thick walls, many narrow windows, and a thick layer of earth and plaster on the roof. Perhaps badghirs

or wind towers in the Persian style would be desirable. The width of these buildings is limited to about 12 or 13 feet by the length (and strength) of the date trunk beams; but a whole range could be put up at I believe moderate expense by people from Muscat. The floors to be of plaster or sunbaked clay; doors, windows, and all joiner's work would be best sent, ready fitted from England or Bombay, with workmen to put them up.

Price of Building.—With reference to the price of building, the Political Resident at Muscat kindly undertook to obtain answers to a list of questions (copy attached) which will, I trust, give the necessary information, without having detained the steamer; Captain Disbrowe, considering that such enquiries should be made in a formal manner, through the Wazir, which would occupy some time.

The Khasab people appear very friendly to the English, and the Sheikh or Wali of the Sultan, said no apprehensions need be entertained on account of people from the interior, or Beduin.

Tides.—The rise and fall of the tide in Khor as Shem is 8½ feet, or less than on the other side by 1½ feet, the time also of high-water is 1*h.* 10*m.* later.

Musendom to Bu-shehr.—From Al Hanch cove, the cable should be laid half a mile off the shore cliffs as far as Ras as Sheikh, in a depth of 15 to 20 fathoms, and starting from a position 2½ miles North of that cape, in a depth of 50 fathoms, take a direct course for a position in 35 fathoms North of the Tumb island, and on the edge of the Basidah flat, where it will lie in muddy bottom, and avoid the rocky overfalls nearer that island. The cable will lie for 18 miles from Ras as Sheikh on a bottom of sand, gravel, and shells; and afterwards in mud, the depths decreasing from 63 fathoms near the cape, to 40 and 35 near the Tumb.

It will then follow round the edge of the flat, as shown, and pass the North end of Farur island in muddy bottom, afterwards pass 4 miles South of Kais island, and then, passing 5 miles outside Sheikh Shaib (avoiding rocky bottom near the Sumberrum shoal), take a course to pass just clear of the flat off Ras Mutaf. The depths in this portion are 30 to 46 fathoms, bottom green mud.

Anchored marks would be required on this part, where the cable approaches the steep edge of Basidah flat, here a vessel should anchor

in advance to prevent the cable getting into shallow water, also off Kais island to mark the edge of the muddy bottom.

R as Mataf.—I have made a zigzag round the edge of the great 10 fathom flat lying to southward of Ras Mutaf, which shows that it does extend a great distance off; also that the edge is steep, there being only 3 miles from 20 to 35 fathoms, it will therefore be necessary to round this shoal as shown in 30 fathoms, or upwards, bottom green mud. Here also a beacon vessel would be very useful, as a considerable saving in the length of cable would result from rounding it closely, or near the edge of the shoal. It would also greatly facilitate lifting the cable at any future time, to have it in the first of the deep water.

From Ras Mataf the cable will take the directions shown on the plan, for a position, 6 miles W. by S. of Ras Rishir (the landing place for Bu-shehr) the bottom continuing equally favourable, and the depths decreasing to 30 and latterly 20 fathoms.

'*Tides.*—The tides near Tumb island are very strong, running upwards of 2′ per hour, about E. by N. and W. by S., or nearly in the direction of the cable just outside Ras as Sheikh, the strength was found to be 2 knots SW. by S. and NE. by N., and as this is across the direction of the cable, and the bottom sandy, or gravelly, it may be considered the greatest difficulty in the way of tide, the cable will meet with; but as the water is deep, this moderate tide would I apprehend not affect the cable (see report on the tide meteor supplied to the expedition.) After passing Farur the tide becomes weaker, and off Kais is under one knot per hour, and no greater velocity than this is met with, until the river is approached.

Landing at Bu-shehr.—In landing near Bu-shehr, the greatest danger appears to be from ship's anchors, as vessels of all sizes up to 800 tons visit the place, and may have to anchor if the wind be light, and tide against them, or if night comes on any where north of Halileh Bay.

Ras Rishir the best Point.—The little cliff close to and forming the South side of Rishir point is the spot selected by us; it combines several advantages. Being 6 miles from the regular anchorage in the outer roads, it is, I am of opinion, as little exposed to the casualty of being fouled by anchors as any part of the peninsula further distant. It is the point nearest to the 10 fathom line. Both to Northward

and Southward of it there is an extent of flat rocky reef varying in breadth from ¼ mile to 150 yards, on which the cable would lie exposed to the sun for some hours in each day, while at this point there is no reef. At Rishir point the steamer under my charge anchored in 2¾ fathoms, soft mud, distant only ⅓ mile, and thence muddy bottom was carried for a distance of 400 yards, or only 300 yards, off shore: thence the bottom is soft rock and sand into the shore, which is of cliffs 20 feet high. It does not dry off more than 50 yards, and it would be easy to trench the soft rock up to high-water mark, or to build a tower at low-water mark, and take the wire from it to the top of the cliff. This landing place is sheltered also from the heaviest part of the sea in a Shemal, although open to the South-easter. The soft stone of the cliff, a coarse shelly conglomerate, in the neighbourhood, is quarried for building stone: it is easily dressed into square blocks.

Size of Cable.—I am of opinion that two cables, say of the 10-ton size, "married" together, would stand little chance of being disturbed: they would sink deep into the mud, and the event of a large ship anchoring, is after all a remote contingency. I cannot recollect ever seeing one anchor anything like so far down. If carried out to the 10 fathom line, 4½ miles would be required on each cable; no special arrangements appear necessary for landing the shore end. Thence to the 20 fathom line the two cables would diverge, the distance being seven and eight miles: bottom soft mud; the water deepening regularly.

Tides.—The tides are weak, setting up and down the coast: maximum certainly under one knot per hour.

Land Line.—Rishir point is 5¼ miles distant from the Residency at Bu-shehr, but only 1½ miles from the Resident's country house. I do not consider any particular notice necessary about the land line. The ground is generally soft rock or stony: near Bu-shehr sandy, with probably rocky foundation at a small depth.

A convenient house for offices in Bu-shehr could be got at a small rent: one of the largest in the town is let to the senior Naval Officer for 60 kerans a month. I much doubt whether the consent of the Persian authorities could be obtained to our building one near the Resident's country house, which would be a far healthier situation—it is five to six miles South of the town.

Bu-shehr to Faú.—The cable would take from Rishir the course shown, so as to pass up the deep water in the gut or seaward continuation of Khor Abdallah, and be landed at Faú. The depth decreases to 20 fathoms at the mouth of the gut, the bottom between this and Bushehr being soft mud. The water further decreases as you advance up the gut, but there is a sufficient difference of depth between it and the banks on either side, to render it desirable it should be marked off with buoys, as the deep water is very narrow. A series of common buoys, say water casks, (which need not be larger than 60 gallons,) laid at intervals of $1\frac{1}{2}$ miles, would be the only effectual mode, and even then a Pilot vessel would have to go in advance to prevent the tide setting the paying-out vessel over to one side or the other. The total number of buoys required would be, say 25 to 30: my views on the number and description of beacons having been modified since my conversation with Colonel Stewart on the subject, by the pilots grounding our vessel twice in the entrance to the Shat al Arab, where the buoys are only $2\frac{1}{2}$ to 3 miles apart.

Nature of Bottom.—The bottom becomes softer as Faú is approached; the dry banks off which place near low-water mark deserve the name of quick-mud: a man sinks in up to the middle in a moment; a bamboo pole was thrust down 10 feet with ease. It is a fine alluvial mud, and the cable would sink several feet in it at once; thereby, I imagine, in a measure obviating the objections on the score of the shallowness of the water to a great extent.

Landing at Faú.—The flat mud bank, extending from the back of the date grove to low-water mark, a distance of four miles, has a slope so gentle as to be almost imperceptible; near Faú it is hard enough to walk on, but becomes gradually softer to low-water mark.

Landing the Cable.—The best way would be to take a flat bottomed iron vessel, which would require to have six to seven miles of cable on board at starting from the ship, then paying out, and consequently lightening her, as you go, get at high-water (springs if possible) as far in on the flat as she will go, and let her ground there.

As such a vessel, with the necessary remaining quantity of cable, would not draw more than 12 to 18 inches, or less than any raft, she might be brought certainly within $1\frac{1}{2}$ or 2 miles of the date grove,

perhaps much less, or where at low-water it would be sufficiently firm by aid of planks to roll the remainder up to the station.

Where the mud is sufficiently hard, I would bury it to a depth of five or six feet, or as deep as could conveniently be dug. For the first mile or more, I am convinced no trenching will be required.

Size of Cable.—I do not see any reason for a heavier than the lightest, or 3-ton size cable, throughout this part. The track is quite unfrequented by shipping: in the shoaler portion, the cable would be deeply sunk in the mud, and over the dry flat a heavy size would only add to the difficulty of landing considerably. Mr. Greener is of opinion, that if buried to a proper depth, the iron casing might be dispensed with.

Old Steamer for Pontoon.—One of the old Indus Flotilla steamers now in Bombay, about I believe to be broken up, would be an economical and efficient pontoon, and be easily steered and towed. Her engines and fittings of every kind removed, and large hatchways fitted, she might be towed up to Muscat or Bu-shehr in the first half of October, which would be the best season for the passage.

Tide.—The tide in Khor Abdallah runs 1¼ to 1½ knots, and takes the direction of the channel. The range of tide on the river side of Faú is 12½ feet (probably the maximum), and is doubtless as much outside. High-water at Faú (river) at full and change; day tides 0*h*. 0*m*. night tides 10*h*. 40*m*. They are much influenced by the winds, the height both of high and low-water, increasing with a South-easter and *vice versâ*.

Station at Faú.—The whole of the country round Faú is flooded at highest springs to a depth of 1 to 1½ feet, except the date plantations, out of which the water is kept by low walls. It is also much intersected by ditches for drainage, which extend quite through the date groves.

On the West side, a low embankment at a distance of 2 to 300 yards from the date groves partially excludes the salt water of Khor Abdallah from the cultivated land. From aloft, during the very high tides we had, this bank appeared like a thread separating two seas, in the nearer of which were some islands planted with date trees.

Site for Building.—The best place for the station is a ruined mud fort about 80 yards square, on the NW. (weather) side of the date trees the material of which levelled would make a platform on which to

build. The position of the buried cable would be in view from this. Proper drainage near it would render the place infinitely drier than at present, and the water should be excluded from the vicinity by a mud wall or enclosure of some extent. Special care would have to be taken in securing the foundation, as the mud or clay, though as hard as brick when dry, loses its consistency when wetted.

Temporary buildings might be erected in the first instance, to ascertain whether European signallers (if such are to be stationed here) could live in the hot weather. There are hardly any people of sufficient intelligence at Faú to obtain information from as to salubrity, but all agreed that it was better than Basrah, and that they did not have to leave it in summer.

This, if true, may be attributable to the proximity of the sea, also to the North-wester blowing across plains wetted by salt water every fortnight. The people are Utubí Arabs from Koweit, the place belonging to one Ibn Bedir of that place; it is a thriving place, and every day new plantations are forming.

Building Materials.—No building materials are obtainable at Faú. Mr. Johnston, the British Consul at Basrah, has kindly given me the following information regarding prices, &c. at that place:—

Kiln burnt bricks, 10 to 12 kerans per 1,000 (size 7 × 7 × 1½.)
Sun dried do. 2 do. do. (made on the spot).
Date trunks for beams or rafters, 1 keran each (made on spot).
Chandul (African wood) for rafters, 2½ to 3 kerans (whole).

Of the latter, which are much more durable, a supply would have to be ordered or sent from Bombay. All joiner's work and fittings should be sent up, also workmen to put them together. The freight from Busrah to Faú would be about 2 kerans a ton.

Report on land line deferred.—I defer the remaining portion of my report, viz. on the land line from Faú to Basrah, until I shall have seen and conferred with Colonel Kemball, there remain certain considerations, I think it will not be out of place to record an opinion on.

Best time for laying the Cable.—I am of opinion, that the best time for laying the cable, unless other considerations render it desirable to do so sooner, would be between the 10th November and the 15th December, both as regards temperature, and settled weather. I would

also submit whether the cables should not be laid from Ras as Sheikh towards Bu-shehr, so as to ensure a head wind to prevent too great speed, and to aid in stopping if required.

Coal Depôt.—I have not been able to overlook the probability of centralizing our depôts in the Gulf. I think Khasab Bay the best site for it, as a place accessible by sailing ships, which no place within the inlet is; it would be inconvenient for the ships of the Gulf's squadron to have to round the quoins to fetch coal, as they would have to do were it in Ghubbet Ghazireh. Khasab affords also a safe anchorage with moderate depths.

In Hanch Cove there is sufficient available ground for storing the coal.

If a station in Ghubbet Ghazireh be preferred, the long low point called Ras Neid is a convenient place; ships could lie in smooth water on its western side within a few yards.

Khor as Shem is quite unfit for the purpose, it is awkward to enter even in a steamer, from its tortuous channel.

There is no peculiarity about the observed temperature of the sea-water sufficient to call for any special remark.

This portion sent to Bombay per "Johnston Castle," 2nd February 1863, also to Constantinople 11th idem, copy with verbal emendations

(Signed) A. W. Stiffe,
Lieutenant Indian Navy.

Part Second.

Faú to Basrah.—In continuation of my report of date 2nd February, I have now to offer the following observations on the route for the land line between Faú and Basrah. This has been traversed by Mr. Greener and myself on horseback, excepting from Faú to Máamer, which was impossible, owing to the heavy rain and very-high tides.

General Remarks.—The difficulties of the line appear to me to be rather due to the nature of the Arabs than to any absolute physical obstacle. The whole of the country, as is well known, is a plain of alluvial clay, very soft when wetted, and drying in the sun to almost the consistency of brick. No stone of any kind is to be seen any

where. At a moderate depth, say 3 to 4 feet, the soil is probably wet throughout the year. At the time we examined it, it was a marsh nearly the whole way, except in the plantations, where drainage is attended to. All the date plantations are intersected at intervals of about 200 yards by canals, cut generally at right angles to the river, and serving both for irrigation and drainage, they extend quite through the plantations. It is probable that we saw the country at its worst; the annual rise does not appear to cause any alteration in the high water level below Basrah; at our visit also rain had lately fallen, and the high tides, consequent on the south-easter, were, I believe, a maximum.

I do not think it would be possible to carry an aërial line quite close to the river bank, certainly not so near Basrah. The numerous canals for irrigation and drainage are also frequented by boats, and for 15 miles below Basrah, by boats of large tonnage, with masts 50 feet high at least: the expense of raising the line a sufficient height above the river to admit of the passage of such boats would be great.

If also it be desirable to keep the wire clear of the foliage of trees &c. the groves are so close to the river as not to admit of a line being carried between them and the bank; indeed, in some parts, trees are frequently falling into the stream.

I am inclined therefore to recommend a line carried close at the back of all the date groves, which would be at an average distance of $\frac{1}{2}$ to $\frac{3}{4}$ miles from the bank (except near Basrah, where it would be two to three miles) as the only practicable plan.

Probably the poles would be sufficiently well secured by being driven in 6 to 8 feet; but if the earth be built up round the poles to a height of several feet, and well "punned" or rammed, it would, when dried, be a great support to them.

Whether a raised roadway should not eventually be formed along the line broad enough for a horseman to ride upon, and so ensure easy access to all parts of it, may be worthy of further consideration. An average height of two to three feet above the plain would be sufficient to keep it above the level of the highest floods, and in many places, such an embankment is already in existence, in part at least. The execution of such a work would be very easy: a ditch on each side, whence the materials could be taken, would serve in some measure as drains, and small bridges of date trunks would be required occasion-

ally. Such a work would, I apprehend, be a great benefit to the people of Faú and Máamer.

On the route map, accompanying this Report, is shown the best line for the wire to take under these circumstances.

Detail of Route distances in Geographical miles.—Fáú to Máamer —about 5 miles. This is the lowest and wettest section: in very high tides the sea-water from Khor Abdallah comes within a short distance of the plantations, the whole way being partially only kept out by a low embankment ½ to ¾ of a mile from the river. There are several new plantations just above Faú, after which there is a space of about two miles between them and Máamer grove, without cultivation and very wet. Máamer is the residence of a chief, whose authority extends from this place to Duasar; there is a large mud fort, half a mile in from the river, at the back of the grove, and many half fortified houses scattered in the date grove, which extends 4 miles along the river. The road is better at the back of the grove, and the low sea-wall would serve as the nucleus of an embankment.

Máamer to Daúreh.—6 or 7 miles. There is a gap of three miles between the date groves of these two places, the road in this part was very bad and wet, owing to there being no drainage. Daúreh is a large new fort at the back of a grove extending about 2 miles along the bank of the river. The road was better here, though still very marshy.

Dáúreh to Duasar, about 4 miles.—The road *lies* along the bank of a small canal which separates Bin Fedagh island from the main: the island is covered with date trees, but there are none on the bank for two miles, and this is very wet in places. Duasar fort is near the South end of the grove and is small; there are many ruined forts to the Northward of it, and also many houses in different parts of the grove.

Duasar to Al Khust, 10 or 11 miles.—The road lies at the back of a date grove the whole way, and is nearly straight. It is much better, and apparently little embankment wanted the whole distance. Al Khust is a small fort and village at the North end of this long grove, and ¼ mile from the river.

Al Khust to Zein, about 8 miles.—The road is very bad, and lies close to the river for 2 or 3 miles to Seíhán, a hamlet and small clump of dates with much cultivation near it. At 3 miles above Seíhán the

date trees recommence: the Southern end of the grove is called Sahal. One mile South of this, a new fort called Gatá is being built: the road is bad as far as Sahal date grove, when it becomes firm, and continues so as far as Zein: very little embankment wanted. Two miles Northward of Sahal is a small fort called Tawa, with a spire tomb about a mile North of it. Zein fort is hidden in the date grove, which is here at least a mile through. After passing Zein, the desert on the left hand presents a singular appearance; it is a mass of mounds for miles, the remains of ancient cultivation.

Zein to Abu Al Khasib Date Grove, 10 *or* 11 *miles*.—First half of the road good; passing at one mile beyond Zein a domed tomb standing in the desert about ¼ of a mile from the trees, and at 2 miles further 2 tombs, one domed, the other with a spire, about a mile apart, at the same distance from the river. Opposite these latter there are only a few scattered date trees for a space of a mile along the river bank, to Westward of which gap extensive date groves commence, and extend without interruption all the way to Basrah, with a width of 2 to 2½ miles from the river. Broad navigable canals intersect them at short distances apart: the one at Abu al Khasib is 50 or 60 yards wide. For 5 miles before reaching Abu al Khasib plantations, the road becomes swampy, and continues so till that place is reached. The fort and large town are 2 to 3 miles, following the winding of the road from the inland edge of the plantations. There are many forts and villages on either side of this place, and as far as Basrah; but none of them are visible when passing along inland of the trees, or from the river.

Abu al Khasib Grove to Basrah, about 10 *miles*.—Road good nearly the whole way along old embankments; little trouble would be required to make it permanently so. At 1 to 1½ miles from the gate, the road enters the groves, passing along the top of an old embankment to the Babaz Zobeir, or SW. gate of the town.

The site of the station in Basrah is a subject that has yet to be decided on.

I have now to refer to one or two points which were omitted in the first part of this report.

Bottom Temperature.—The temperature of the sea-water at the bottom was repeatedly observed, but did not differ materially from that

at the surface, which might have been anticipated. Such observations require to be taken during the hottest season to give any result of importance to the well-being of the cable.

Currents at Bottom.—At Ras al Kúh and off Ghubbet Ghazireh the stream was so weak as hardly to call for such observations. At Ras as Sheikh, by attaching a heavy lead to the meteor, it was sunk to about 15 fathoms below the surface, and there registered similar results to those at the surface. The whole apparatus was swept off the bottom owing to the strain on the line. A wire line might have enabled me to obtain more satisfactory results.

Permanent Marks.—A permanent mark should be placed at the mouth of the gut of Khor Abdallah, or about 60 miles from Faú. It should be a first class buoy, with perhaps a perch, and should be anchored with one or more old guns, so as not to give the Arabs the temptation of stealing the anchor. The buoy to be placed, say half a mile to Northward or Southward of the cable. Above this position, the cable might be picked up by a vessel feeling her way down or up Khor Abdallah, keeping in the deep water, and crossing from side to side, always provided the cable is not too deeply sunk in the mud, which near Faú, I think very probable. Another buoy might perhaps be placed midway between the last, and a point at which Khareg island would be visible; or two more at equal distances apart. In the remaining portion of the cable no marks would be required; sketches should be constantly taken while paying out, particularly when passing islands, noting its appearance, and the degree of visibility, as whether the beach is "up" or merely the highest part visible, or the elevation by sextant of the highest peak should be noted, or any remarks made, which would enable a stranger, when the high land is not visible, to correct his estimated distance off it.

The soundings shown were all taken with Massey's Sounding Machine attached to the lead, which was also fitted with a cup and valve for bringing up specimens of bottom. They were fixed by two or more angles to shore objects; no magnetic bearings being used, the "Johnston Castle" being an iron ship, and her compasses not having been adjusted since leaving England: out of sight of land as numerous celestial observations as possible were taken, and near the river they were partly fixed by sound.

Farsi Island.—In accordance with a suggestion of His Excellency Sir Bartle Frere, I have visited and sounded across to the island of Farsi, with the view of ascertaining its eligibility as a place to land the cable at, should political considerations preclude its being landed at Bu-shehr. The depths are 30 to 32 fathoms, muddy bottom all round within a mile, and on the South side, where there is least reef, within a third of a mile, thence to the island a very heavy shore-end would be required, as the rocky reef surrounding it is very rugged, and it is exposed to the full sweep of the South-easterly sea.

The island is quarter of a mile in extent, and quite level: it is only 3 or 4 feet above the sea level, and is covered with brushwood. At the North end, a small beacon of stones has been piled up to a height of 10 feet. There is no water on the island, which is frequented by numbers of sea birds and by turtle. It is uninhabited, but occasionally visited by fishermen from Khareg, who catch fish and turtle.

Copy with slight emendations sent to Constantinople 11th February and to Bombay 12th idem.

(Signed) A. W. STIFFE,
Lieutenant, Indian Navy.

True Courses and Net Lengths of Cable.

From Ras Jashk—L. 84° W. 12·5 Naut. miles.
N. 55° W. 21·5
N. 63° W. 44·0
Add length in Ghubbet Ghazreah ..... 8·5

Total Jashk to landing place on Isthmus... 86·5
Add for Jashk to Guadur about..... 260·0

Total Guadur to Musendom ..... 346 Naut. miles.
Length in Khor as Shem and Kharabhoy...16·0 Naut. miles.
From position North of Ras as Sheikh.
N. 87° W. 46·0
S. 86 W. 6·0
S. 79 W. 14·0
N. 87 W. 17·5
N. 77 W. 10·0

	N.	81° W.	27·5
	N.	75 W.	14·0
	N.	63 W.	21·(
	N.	69 W.	87·0
	N.	68 W.	14·0
	N.	58 W.	8·0
	N.	48 W.	12·0
	N.	35 W.	41·0
	N.	24 W.	41·0
	N.	1 W.	11·0
	N.	62 E.	8·5
	N.	80 E.	6·0
Total Musendom up to landing at Bu-shehr			400·5
From landing at Bu-shehr	S.	80° W.	6
	N.	68° W.	29
	N.	78 W.	53
	N.	47 W.	22
	N.	37 W.	8
	N.	32 W.	5
	N.	51 W.	11
	N.	61 W.	6
	N.	24 W.	5
Over the mud	N.	9 E.	4

Total Bu-shehr to Faü ..... 149·0 Naut. miles.

Abstract.

Bu-shehr to Faü	149·0
Bu-shehr to Musendom	400·5
Ras Jashk to Musendom	86·5
Ras Jashk to Faü	636·0
Add for Jashk to Guadur about	260·0
Net Total	896·0
10%	90·0
Gross Total	986·0

ART. XIII.—*On a Method of Calculating Altitudes from Barometrical Observations without the use of Logarithms.*—By J. BURGESS, Esq., *F.E.I.S.*

[Read before the Society, April 21st, 1864.]

IN the Philosophical Magazine for January 1863, I gave an investigation of a method of measuring heights by means of the temperature at which water boils; whilst preparing it my attention was also directed to the Barometrical measurement of altitudes, and the simplification of the formulæ of computation. Want of leisure has, till now, prevented my putting my results on paper.

2. In a paper on Hypsometrical Measurements in the Journal of the Asiatic Society of Bengal for 1858, I have shown that if we neglect the terms dependent on the latitude of the stations and the moisture in the air, Bessel's formula for the difference of elevation in terms of the atmospheric pressures and temperatures, when the best determinations of the physical constants are employed, becomes for English measures—

$$h' - h = 60369{\cdot}15 \times \frac{398{\cdot}37(1+aT)}{397{\cdot}37 - aT} \times (\log B - \log B') \quad \ldots\ldots (1)$$

where T = half the sum of the temperatures t and t' at the two stations reckoned from the freezing point, or $\frac{1}{2}(t + t' - 64°)$ on Fahrenheit's scale;

$a = \frac{1}{490{\cdot}4} = 0{\cdot}002039$, the expansion of air for 1° Fahr. as determined by Regnault;

B and B' are the heights of the Barometer at the lower and upper stations respectively reduced to the same temperature;

And $h'-h$ is the difference of altitude of the stations.

3. Now the formula (1) may be written without appreciable error—

$$60369{\cdot}15 \left(\frac{398{\cdot}37}{397{\cdot}37} + \frac{t+t'-64}{975{\cdot}4}\right) \log \frac{B}{B'},$$

$$\text{Or } 60521{\cdot}07 \left(1 + \frac{t+t'-64}{977{\cdot}9}\right) \log \frac{B}{B'}.$$

And this is easily reducible to—

$$\left\{61882{\cdot}6 - 61{\cdot}889\ (86 - t - t')\right\} \log \frac{B}{B'}$$

which does not differ sensibly from—

$$61882{\cdot}6\ \frac{914 + t + t'}{1{,}000}\ (\log B - \log B') \quad \ldots\ldots\ldots\ldots (2)$$

This reduces the correction for the temperature of the air to the simplest form.

4. Since $B > B'$, we may write $\frac{B}{B'} = 1+n$; and by a common logarithmic formula—

$$\log B - \log B' = \log (1+n) = 2\,\mathrm{M} \left\{ \frac{n}{2+n} + \frac{1}{3}\left(\frac{n}{2+n}\right)^3 + \frac{1}{5}\left(\frac{n}{2+n}\right)^5 + \ldots \right\} \quad (3)$$

$$\text{But } \frac{n}{2+n} = \frac{B-B'}{B+B'},$$

and since this quantity is always less than unity, and for moderate heights is very small, the second and following terms of the series in equation (3) will only be important at considerable altitudes.

5. Put $\log B - \log B' = \log\ (1+n\ ) = 2\,\mathrm{M}\ \frac{B-B'}{B+B'}\ (1+d')$; and, M being the modulus of the common logarithms, by substitution in equation (2) we have—

$$h' - h = 36{\cdot}75\ (914 + t + t') \times \frac{B - B'}{B + B'}\ (1 + d') \quad \ldots\ldots\ldots (4)$$

But—

$$\frac{B - B}{B + B'}\ B\ d' = \frac{\log B - \log B'}{2\,\mathrm{M}} - \frac{B - B'}{B + B'}, \quad \ldots\ldots\ldots\ldots\ldots (5)$$

Or, putting $x = \frac{B - B'}{B + B'}$, and consequently $\frac{B}{B'} = \frac{1 + x}{1 - x}$, we have by substitution in equation (5)—

$$d' = \frac{1}{2\,\mathrm{M}\,x} \log \frac{1 + x}{1 - x} - 1,$$

$$= \text{Hyp. log. } \sqrt[2x]{\frac{1 + x}{1 - x}} - 1 \quad \ldots\ldots\ldots\ldots (6)$$

From this the values of d' might be determined for all values of x. At 10,000 feet $x = 0{\cdot}185$; at 20,000, $x = 0{\cdot}372$, &c.

6. But the barometer is never read to less than $\frac{1}{1000}$ of an inch, which corresponds to a difference of level of about a foot. We may therefore slightly alter the co-efficient 53·75, so as to diminish the correction for considerable altitudes, whilst for heights under 2,500 feet it

may be entirely neglected even when extreme accuracy is desired. Thus, if we make the co-efficient 53·775, the difference of elevation found by neglecting d', will be the same as by the formula (2) when $\frac{B}{B'} = 1{\cdot}07663$, or $\frac{B - B'}{B + B'} = x = 0{\cdot}03690113$.

And, putting L = 61882·6, and C = 53775, and since 2 M L = 53750, we have for the error or difference at any lower altitude—

$$Cx - L \log \frac{1+x}{1-x},$$

and when the difference is greatest—

$$x^2 = \frac{C - 2\,M\,L}{C},$$

$$\therefore x = \sqrt{\frac{1}{2151}} = 0{\cdot}021562,$$

$$\text{and } \frac{B}{B'} = \frac{1+x}{1-x} = 1{\cdot}044073.$$

But for this value of $\frac{B}{B'}$, L $(\log B - \log B')$ = 1159·12 feet, and Cx = 1159·47 feet, the difference being only 0·35 feet or 4¼ inches—quantity considerably within the limit of the errors of observation. With the co-efficient 53·8, the error would be about 1 foot at 1640 feet.

7. Since the approximate height, uncorrected for temperature, is—

$$Cx = L \log \frac{1+x}{1-x} - D,$$

$$\text{and } D = L \log \frac{C + Cx}{C - Cx} - Cx$$

$$= 53750\ (x + \tfrac{1}{3}x^3 + \tfrac{1}{5}x^5 + \&c.) - 53775x \ldots\ldots (7)$$

We may now write equation (4) either as—

$$h' - h = 53{\cdot}775\ (914 + t + t') \times \frac{B - B'}{B + B'}\ (1 + d) \ldots\ldots (8)$$

$$\text{Or, } h' - h = \left(53775 \times \frac{B - B'}{B + B'} + D\right) \times \frac{914 + t + t'}{1000} \ldots\ldots (9)$$

where $d = \frac{53750}{53775}\ d'$, and may be found by eq. (6), or from the expressions—

$$d = \frac{61883}{Cx} \log \frac{53775 + Cx}{53775 - Cx} - 1 \ldots\ldots (10)$$

$$= 1{\cdot}15177\ (\log B - \log B') \times \frac{B + B'}{B - B'} - 1;$$

or, with sufficient accuracy by the approximate formula—

$$d = x^2\ (0{\cdot}273 + {\cdot}2417\ x).$$

Or D, which is the correction in *feet*, may be obtained from the

formula (7) or (10) which are identical, and approximately by writing $\theta = \frac{h'-h}{1000}$, and—

$$D = \theta^3 (\cdot 09207 + 0\cdot 001723\ \theta)$$

Both these forms of the correction are tabulated in Tables I. and II. but it will be found that the second is generally the most convenient.

8. The linear expansion of mercury is 0·0001001 for 1° Fahr., and of brass 0·0000104, so that the expansion of a brass scale extending from the cistern is less than that of the mercury in the barometer tube by 0·0000997, or very nearly $\frac{1}{10000}$th for 1° Fahr. Hence, to reduce the observed heights of the barometer to the same temperature, we must subtract from the height of the mercury at the higher temperature $\frac{1}{10000}$th part of itself for every degree in the excess of the temperature of the mercury over that in the other observation.

9. The expression in equation (9) requires two small corrections on account of the variation of gravity with the latitude and the height. The first is a multiplier of the form—

$$\frac{1}{g} = \frac{1}{1-\cdot 0026 \cos 2\lambda},$$

where λ is the latitude. The second gives the true difference of altitude—

$$H'-H = h'-h + \frac{h'^2}{r-h} - \frac{h^2}{r-h},$$

where r is the mean radius of the earth. This term, which is very small, may be readily found by multiplying the difference of the squares of the thousandth parts of h' and h by 0·048.

10. We have then—writing h′ for $\frac{h'}{1000}$, and h for $\frac{h}{1000}$,—

$$H'-H = (53775 \times \frac{B-B'}{B+B'} + D) \times \frac{914 + t + t'}{1000} \times \frac{1}{g} + \left(h'^2 - h^2\right) \times 0.048$$

This gives following RULE—

Reduce the observation at the higher temperature to the lowest temperature, by deducting $\frac{1}{10000}$*th part of itself for every degree Fahr. of difference of temperature.*

Take the sum and difference of the corrected readings at the upper and lower stations.

Multiply the difference by 53775 *and divide by the sum of the readings, and to the result add the correction D taken from Table II or computed by formula* (7).

To the sum of the temperatures of the air, in Fahrenheit's scale, add 914, *and multiply the result last obtained by this sum, dividing the product by* 1000—*or, striking off three figures as decimals. This gives the height very nearly.*

Opposite the latitude λ in Table III is the correction *per cent.* to be applied ; and in Table II. is given the correction for variation of gravity with the altitude.

Example.

MM. Bravais and Martins on the 29th August 1844 made the following observations for the height of Mount Blanc :—The height of the Barometer one metre below the summit was 424·05^{mm}· the attached thermometer —4°·2 C. =24°·44 F. and the temperature of the air —7°6 C. = 18°·32 F ; the barometer of the Observatory of Geneva (407^{m} = 1335 ft. above the sea level) read 729·65^{mm}·, the attached thermometer 18°6 C.= 65°·48 F. and the temperature of the air 19°3 C. = 66°74F.

Here $t-t' = 65°{\cdot}48-24°{\cdot}44 = 41°{\cdot}04$.

B	729·65mm.	Constant	914
$\frac{41}{10000}$ of B	—3·00	t	66·74
B corrected	726·65	t'	18·32
B'	424·05	Sum	999·06
$B-B'$	0^{m}30260	C	53775
$B+B'$	1^{m}15070.	× B—B'	6203·
			161325
			1075
			323
		Product .	16272·3

Dividing 16272·3 by $B+B'$=1^{m}1507, the quotient is	14147·7
By Table II. D for 14000	323·3
Prop. part for 148	10·8
Sum	14481·8 ft.
$\frac{999{\cdot}06}{1000} = \frac{1000-0{\cdot}94}{1000}$, and p. p. for ·94	—13·5
	14468·3 ft.

$\therefore h'-h = 14481{\cdot}8 \times \frac{999{\cdot}06}{1000}$

	Then.....		14468·3 ft.
$\lambda = 46°$	145 × 0·009	=	—1·3
h', 14500 nearly, by Table II.			+ 10·1
h, 1335			—0·1
H′—H.....			14478·0 ft.
One metre.....			3·3
Height of Geneva.....			1335·3
Height of Mount Blanc.....			15816·6 ft.

M. Plantamour's Tables give 15820·3, and Delcros's 15796 ft.

TABLE I.

Values of the Corrections for different values of $x = \frac{B-B'}{B+B'}$.

x	$\frac{B-B'}{B+B'}d.$	D.	$x.$	$\frac{B-B'}{B+B'}d.$	D.	$x.$	$\frac{B-B'}{B+B'}d.$	D.
		feet.			feet.			feet.
·04	·000003	0·2	·19	·002250	120·7	·34	·013926	749·2
·05	·000020	1·0	·20	·002640	142·0	·35	·015278	822·7
·06	·000042	2·5	21	003073	165·6	36	016715	898·8
·07	000083	4·5	22	003553	191·8	37	018247	981·4
·08	000135	7·3	23	0040S3	219·9	38	019870	1069·3
·09	000203	11·0	24	004663	260·8	39	021613	1162·5
·10	·000290	15·6	·25	·005295	284·3	·40	·023464	1261·6
·11	000397	21·6	26	005985	321·8	41	025413	1366·8
·12	000525	28·3	27	096737	361·1	42	027439	1478·3
·13	000680	36·5	28	007551	405·0	43	029688	1596·5
·14	000861	46·3	29	008431	452·8	44	032014	1721·7
·15	·001072	57·7	·30	·009379	504·1	·45	·034480	1854·4
·16	001314	70·6	·31	·010401	559·3	·46	036998	1994·2
·17	001588	84·9	·32	011497	618·2	47	039839	2142·3
·18	·001899	101·6	·33	·012668	681·0	·48	·042749	2298·7

TABLE II.

Corrections for different Heights.

$h'-h$	Cor. D	Diff. for 100 ft.	$h'+h-$	$h'-h$	Cor. D	Diff. for 100 ft.	$h'+h-$
feet.	feet.	ft.	ft.	feet.	feet.	ft.	ft.
2,000	+ ·02	0·18	0·2	16,000	491·4	10·36	12·3
3,000	1·8	0·38	0·4	17,000	595·0	11·79	13·8
4,000	5·6	0·66	0·8	18,000	712·9	13·36	15·5
5,000	12·2	1·01	1·2	19,000	846·5	15·11	17·3
6,000	22·3	1·45	1·7	20,000	997·6	16·97	19·2
7,000	36·8	1·94	2·3	21,000	1167·3	18·97	21·1
8,000	56·2	2·53	3·1	22,000	1357·0	21·19	23·2
9,000	81·5	3·16	3·9	23,000	1568·9	23·54	25·4
10,000	113·1	3·88	4·8	24,000	1804·3	26·15	27·6
11,000	151·9	4·74	5·8	25,000	2065·8	28·96	30·0
12,000	199·3	5·71	6·9	26,000	2355·8	32·04	32·4
13,000	256·4	6·69	8·1	27,000	2675·8	35·35	35·0
14,000	323·3	7·80	9·4	28,000	3029·3	38·90	37·6
15,000	401·3	9·01	10·8	29,000	3418·4		40·3

TABLE III.

Correction for Latitude.

$\lambda+$	$\lambda-$	Per cent.	Diff. for 1°	$\lambda+$	$\lambda-$	Per cent.	Diff. for 1°
0°	90°	·2623	4	28°	62°	·1470	79
4	86	·2608	18	32	58	·1152	85
8	82	·2536	33	36	54	·0813	88
12	78	·2405	44	38	52	·0636	90
16	74	·2230	53	40	50	·0456	93
20	70	·2017	64	42	48	·0270	93
24	66	·1760	72	45	45	·0000	93

Bombay, March 1864.

P. S.—At the Meeting at which this paper was read a number of the Proceedings of the Royal Society was presented containing a paper on the same subject. The method of treatment and the constants differ from those in the preceding; both are founded on Leslie's formula.—J. B.

ART. XIV.—*An Island rising out of the Sea.* *By Captain* C. DODD, Deputy Collector, Sind.

Read before the Society, April 21st, 1864.

A SHORT time ago, the following narration, written by a deceased relative, of the rise out of the sea of a volcanic island in the Mediterranean, fell into my possession. As a similar phenomenon is reported by the papers to have recently occurred, I am induced to make it public, believing that it may prove of interest.

Her Majesty's Ship "Melville," at sea, August 5th, 1831, at 6-30 P.M. smoke, which was concluded to rise from the volcano, was first visible bearing NW. by W. at the estimated distance of 34 miles. The "Melville" steered for it, and as she proceeded the smoke became more apparent. It rose to a considerable height above the horizon from three distinct sources, but on further observation I determined that the body of smoke had been so divided by the wind after issue from the crater, for presently some more rose to windward, whose more rapid ascent showed that this alone originated directly from the volcano. As this settled over the face of the waters in a tardy progress to leeward, it assumed many picturesque forms. At one time I fancied it like a large Gothic edifice with a dome over the centre, which, as the outline broke off, changed to the semblance of crystallizations, particularly those of alum. After dark, forked flames were seen to dart upward occasionally, and a loud rumbling noise was heard, compared by a young midshipman to the rattling of a chain cable.

August 6th.—At daylight, the "Melville" being distant by estimation 10 miles, the island itself was visible as a hillock, approaching in form to a cone, unequally broken off at the top, yet having that smooth clearly-defined outline which I believe is the usual characteristic of volcanic mountains. We now began to witness the wonderful operations of the volcano in all their grandeur, of which I really despair of being able to give but a very faint idea, no description of mine can do justice to the sublime sight.

8-30 A. M.—The volcano, distant about 3 miles, became very active, it was never entirely free from vapour, but about this time a most violent eruption took place. A fleecy vapour of a dense consistency, but of an ætherial hue, rose in globular clouds from the crater, which, convolving themselves majestically in their ascension, assumed the appearance of a towering plume, and being rolled out on each side, at the summit resembled (*si parva licit comparare magnes*) that which is the decoration of the Prince of Wales. Into this gigantic plume of lucid vapour large stones were thrown up, carrying in their train quantities of black dust projected in the form of a cone, of which the stone may be considered the apex. Some of these conical projections were perpendicular, others curved, and as they rose and fell together, they broke out into a thousand curious shapes, but resembled most to my fancy a grove of cypress trees bent by the wind, or the fantastic ramifications made by a piece of zinc in a bottle of water. Having lost their projecting power, they fell in shivered flakes like an avalanche, and the effect of their falling through the white vapour was magically beautiful. All this time the mass of vapour was increasing and extending itself so much as to envelope the whole island, and hid it from our view for the space of three or four minutes. Like that which issues from Vesuvius, this vapour hangs together in an ascending column, unbroken for a much longer time than common smoke, and breaks off into a separate cloud before it is dissolved in air. Flashes like lightning darted occasionally through the vapour, and noise as of thunder was now heard distinctly. In the course of the eruption stones fell into the sea at an estimated distance of 70 feet from the island; as the splash of which was much greater than that made by a shot fired from a long eighteen-pounder at the greatest elevation, they would appear to be of very considerable magnitude.

The eruptions were most violent at intervals of about two hours, and at 11 A. M. another took place in some respects different from that which I have attempted to describe. This was attended with the same thunder and lightning, if I may so call the noise and flame, a similar burst of white vapour at its commencement, and similar projections of stones and dust, but immediately after the latter there followed a copious mass of dark lurid smoke, which over-powered the white vapour, and as that had done, covered and obscured in its turn the whole island.

The effect produced by this eruption was, if possible, more impressive than that by the former: less beautiful, but more awful. I could fancy the volcano to have changed from smiles to frowns; before to have been the residence of an airy sprite, now of a fiery demon. This dark smoke did not remain in globular clouds so long as the lucid vapour; it spread itself in a flaky manner on each side over a space perhaps of half a mile, brooded as it were over the island, and then was slowly and sullenly dispersed.

The wind was light, and the "Melville" had made but little progress in the forenoon; at 1 P. M., however, she had passed the NE. corner of the island, when a new and very striking point of view was disclosed. The immediate source of these eruptions might now be partially seen as the vapour cleared away. Here was the mouth of the crater. On this side the island did not rise above the level of the sea, but formed a bay, indeed a plane section of it may be said to have the shape of a horse shoe with the sides somewhat beaten out, the open part representing the side of which I am now writing. From this opening there ebbed a boiling bubbling stream, making its own mark in the sea for the distance of perhaps of three-fourths of a mile, as a river will communicate its own colour to the waters of one less rapid at their junction. Here it seemed as if a continual conflict was waged between the two elements of fire and water, as the sea would strive to enter the mouth of the crater it was opposed by the fire within, repelled in part with the greatest violence, but succeeded in leaving behind a foaming steamy charybidis.

The volcano was in sight from the "Melville" for about 36 hours, during the whole of which time it was in a state of eruption more or less violent, the dark or white vapour predominating occasionally, but more frequently the latter: at 8 P.M., when the ship was 6 or 7 miles to leeward of the volcano, a great quantity of brown gritty dust fell on board, and almost every one remarked the very oppressive closeness of the atmosphere, and the strongly sulphuric odour which pervaded it.

The nature of the eruptions was such as I have attempted to describe, but upon perusal of what I have written, I am more than ever sensible how very much the description must fail in conveying an adequate idea of the grandeur of this phenomenon. We are apt generally to receive such accounts as these with a certain allowance for

exaggeration, without however imputing any wish to deceive the narrators, and this was the feeling in the "Melville" before she left Malta; but I may safely declare that there is not one on board who will not confess that the sight of this sea volcano has far surpassed the expectations of wonder which he had conceived from report. Many on board have been in all quarters of the globe, but nowhere have they seen so wonderful a sight as this volcano sending up a column of vapour of the most beautiful hue and varied form to the height of nearly a mile. Some idea of its violence may be formed, when it is considered that it forced its way upwards through the sea where it was 170 fathoms deep. Subjoined is the result of a few nautical observations relative to the situation and size of the island when seen from the "Melville."

Lat. by mer. obs. of sun..... 37° 10′ 54″ N.
Long. by Chronometer..... 12° 44′ E.
Computed height of island above level of sea ..... 95 feet.
Computed average height to which vapour rose in unbroken column..... 1186 yards.
Computed distance between extreme points of island, centre of crater bearing NW..... 435 yards.

N.B.—These computations having been made from only an estimated base, it being impracticable to measure one, the results must be considered as only approximations to the truth; but I can declare them to be rather *under* than *overstated*.

(Signed) C. DODD.

H. M. S. "Melville" at sea, August 10th, 1831.

The writer of the above was an officer on board the "Melville," and I am not aware that this account has ever been published. A few months ago the English papers contained a notice of the re-appearance of an island near the coast of Sicily of volcanic creation, and which, it was believed, had many years ago "sunk under the waters." It was known in the old maps by the name of Graham's Island. Can this be the same one now described?

(Signed) C. D.

TRACING SHEWING THE ROUTE AND COAST LINE
FROM
MOUD BAY TO THE TOWN OF BORDER ABBAS.

ART. XV.—*Remarks on the Port of Lingah, the Island of Kishm, and the Port of Bunder Abbass, and its neighbourhood. By Lieutenant Colonel* LEWIS PELLY, *Acting Political Resident, Persian Gulf. Contributed by Government.*

[Read before the Society, April 21st, 1864.]

No. 6 OF 1864.

POLITICAL DEPARTMENT.

From Lieutenant Colonel LEWIS PELLY, Acting Political Resident, Persian Gulf,

To W. H. HAVELOCK, Esquire,

Officiating Secretary to Government, Bombay.

Residency in the Persian Gulf, dated Bushire, 16th January 1864.

SIR,

As proposed in my letter now marginally noted, I left Bushire by the last mail steamer and landed at Lingah, whence I came on to Bassidore, visiting the Salt Caves and Naptha Springs on the Island of Kishm, and so, passing down the Clarence Straits, touched at Khumeer to see the formations of sulphur and red ochre, and thence, passing on to Bunder Abbass, awaited there the return of the mail steamer to Bushire, visiting in the meantime the Island of Hormuz.

No. 147 of 1863, dated 28th November 1863, Secret Department.

2. An appended tracing from the chart, obligingly prepared for me by Captain Warner, shows my line of route.

3. I have now the honour to submit a few additional remarks in continuation of those contained in my general sketch of the Trade in the Persian Gulf, concerning in particular the Port of Lingah, the Island of Kishm, and the Port of Bunder Abbass and its neighbourhood.

No. 67 of 1863, dated 13th April 1863, Political Department.

4. Lingah contains a fort, and is surrounded by an unwalled town of stone, flanked on either side along the shore line by a series of clusters of houses, overhung with date trees. The roadstead is open, and though sheltered from the North-west, is dangerous for shipping during the prevailing South-east and South-west winds, but a solid masonry breakwater affords protection to small craft. Lingah may be some twenty-five miles distant from Bassidore in a North-westerly direction, and is the chief town of a district lying immediately between the sea and barren and precipitous mountains which lead up through Lar, and so on to the Shiraz road. The district touches the Sheikhdom of Moghoo on the North-west, and extends South-east almost to Bunder Mollum and the region farmed under Bunder Abbass by the Sultan of Muskat. About four miles South-east of Lingah lie the ruins of the Portuguese Port Kongo. Portions of what seems to have been the factory and a half-moon casemated battery are still standing close to the water line, as are also the ruins of a breakwater from which probably the idea of that of Lingah was taken. The produce of the district consists of dates and some barley and wheat sufficient for home consumption. The Sheikh of Lingah is an Arab, and claims to be a descendant of a family that emigrated to the Persian Gulf at the period when the Arabs were at the height of their power at Baghdad. He is, I believe, related to the Rasulkhymah chief on the opposite coast. No import or export duty is due in Lingah, and it is probably to this fact,* and to that of geographical position, having preserved the port from Governmental interference, that its hitherto prosperity is due. At present the township, with its adjacent suburbs, may contain 8 or 9 or 10,000 inhabitants, of whom the bulk are evidently Africans. The wealthier class are Persianized Arabs, and some Persians also have been attracted from the upper country for labour on the spot, or as carriers into the interior. There are also some twenty Hindoos residing in the place as Agents for Firms in Bombay or Kurrachee. It appears from this statement, as well as from the conversation of the merchants them-

* A straw shows which way the wind blows, and a needle indicates the north pole, so wherever I go I find that be the spot ever so unfavourably situate, and its national importance ever so small, still absolute freedom in trade is invariably followed by traders preferring this point to other possessions with natural advantages. Will the day ever arrive when Custom Houses shall be numbered among the things which were but are not?

sēlves, that the little commercial importance of this place is due to its being conveniently situated as a point of agency for trade coming from India and seeking a market along the Arabian coast of the Gulf and so to the Persian territory in the immediate neighbourhood of Lingah and towards Lar. Goods are landed, and, if prices pay, are sold on the spot, and are sent towards the interior at the risk of the purchaser. Lingah merchants consider the road through the Eliant haunts too insecure to permit of their trading themselves with the interior. It is however I think obvious that, unless owing to accidental circumstances, Lingah, from its geographical position, and from its dangerous anchorage, would be quite unable to compete with the inland trade of Bushire or Bunder Abbass; and its statistics show that the bulk of its trade is with the maritime Arab ports, goods being re-shipped thither in small coasting craft according to demand and opportunity. Specie and pearls, and perhaps a little salt-fish, are, I believe, the only returns from the Arab ports. About eight or ten boats are engaged at Lingah for the pearl fishery. There may be some 150 native craft of all sizes belonging to the people of the place, and it is remarkable that although labour is cheap and efficient in boat-building along the Western coast of India, yet the builders at Lingah prefer to import their wood from India and build their buglas (which seem of capital construction) on their own beach.

5. From Bassidore I crossed the island to visit some salt caves and naptha springs. The road, after leaving a ledge of rock on which Bassidore is built, descends a few feet into a plain, sprinkled here and there with a few date trees, and passes the ruins of an old Portuguese fort, situated on a detached rock, and overlooking the Clarence Straits. After some seven miles you reach the village of Gooree, and thence wind among low hills for about five miles more into the plain of Kownee, distant only a mile or two from the seaward shore. Leaving Kownee, you pass eastward along a valley towards a range of dark-red hills; these form the salt range. The general formation of the island, which, like that extending all along this and the Mekran coast to Kurrachee, is a coarse sandstone grit and conglomerate, overlying blue lias marl, * now suddenly ceases, and the salt formation, which seems to extend

* I speak of the prevailing character of the region, a good section of which is laid bare in the cliff at Munora Point near Kurrachee.

some way into the interior of the island, abuts on the shore line, with which it runs parallel at a few hundred paces distance for some five miles, when it again abruptly turns inland. The general aspect of the range is dark-red, alternating with slate colour, strewed in part with earth. The scarps are steep, and the height of the summits may vary from 3, 4, to 600 feet. The entire range seems to be salt, and reminded me of the salt hill near Nishapoor, on the road from Tehran to Meshed. The two sets of salt caves which I visited were respectively at the two extremities of the shore face of the range. The cave on the side nearest Kownee is comparatively small, and does not seem to be worked ; but one of the caves on the further extremity is of truly noble proportions, being a vault of from 2 to 300 feet in height, of about the same length, and with a span of 60 or 70 feet. The entire arch of the cave is beautifully streaked like marble, while large crystalline salites hang from the roof in festoons white as snow. Another cave of lesser dimensions is in the immediate vicinity, and it is this one which is principally worked. It may be about a mile distant from the beach : a sufficiently good path for camels and donkeys leads up to it. The blocks of rock-salt quarried from the interior of the cave are laid in heaps at its entrance to be carried by donkeys and camels to the sea-shore, where it is stowed in small native craft and carried to Muskat, for ultimate exportation to Calcutta and the east coast of Africa. The period of working is said to be about five months in the year, beginning from the early spring, when from 100 to 150 hands may be daily employed. The reason alleged for non-working for salt during the remaining months of the year is, that boats cannot lay in shore for landing unless during the calm season, but I rather suspect that the working is regulated by the demand. Every boat shipping salt pays 2 krans, or about one rupee per ton, to the Sheikh of Kishm, and every camel employed in carrying pays 5 krans per annum to the same authority. It is said (and from the general appearance of the place it seems certain) that working in them is dangerous on account of the frequent falling of large blocks of salt from the roof and sides. Many labourers are said to have been killed in this manner ; and among other numerous débris I noticed one solid mass of pure rock-salt, about 12 feet thick, with sides of 16 feet, which had recently fallen across the centre of the cave. It does not appear that the pure salites abovementioned are made use of, although I found the few

specimens that I gathered to be the best and purest table-salt I ever tasted. No fresh water is found in the immediate vicinity of these caves; the labourers collect their drinking-water from a brackish well, and one or two artificial rain-water tanks about two miles distant. The water that we drank while pitched there was brought from wells dug close to the base of the Kownee salt range.

6. Doctor Colvill has obligingly collected specimens of the rocks found in the valley and caves. These are transmitted to Bombay by the present opportunity, and appear to me to be of an interesting character.

7. Leaving the salt range, and still following the shore line eastward, the general formation of sandstone and blue layer is at once resumed. The valleys run parallel with the coast line, and the layers rise on either hand in almost perpendicular scarps to the height of 1, 2, or 300 feet, topped with overhanging ledges of grit. It seems, indeed, as though the island had originally been a continuous table land, but that the scourings of the scant rain, and prolonged exposure to the wind and atmosphere, had gradually broken the table into a series of gulleys and eventual valleys. The appearance of this side of the island is parched and barren as that of the Persian coast in general. Is it that Nature, when forming this globe, cast her refuse into this Gulf? Or is it that she left this part of her work unfinished? Or is it that this, like other vast tracts of the earth, is reserved for a time when man shall multiply, and science shall discover the art of equalising the rainfall over all lands? Is it, finally, that Nature, weary of hideous desolation, is hurrying these regions to decay?*

8. Passing along one of these valleys for about six miles, and about three miles before reaching the village of Saleek, a little inland, lie the naptha springs. I send by this opportunity two bottles of the liquid collected in the stream, and which seems of average burning quality. The springs are, however, scant, and I should think of little worth to trade.

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* Wordsworth would never have applied the epithet "everlasting" to the southern hills of Persia. They are all hollow and tumble-down as the towns are. Passed at night, the gloom of their gorges and the precipitous height of their flanks lend them a bold and solemn appearance, but with daylight the illusion vanishes.

9. Returning to Bassidore I embarked again on the schooner, and passed down the Clarence Straits through the narrow or Kishm Channel. After a few miles, the Strait narrows to a breadth of a hundred yards or so, and winds for a distance of about 21 miles between low islands and banks covered with bauble, and fringed below the water line with mangrove. A creek then turns short to the right, and leads up to the small town of Luft. This township lies close to the shore, at the foot of a scarped slope, the scarps being strengthened at their crests by curtains and flanking works. At the furthermost side of the town is a square fort, with circular towers at the angles pierced for guns. The present inhabitants seem entirely ignorant of the history of these fortifications, but from their construction and masonry I suppose them to be European. Like the rest of the island of Kishm, Luft is farmed by the Sultan of Muskat, and is sublet to a sheikh for about 1,500 Rupees per annum. It may contain 4 or 500 inhabitants, who seem entirely dependent for trade on the wood which they collect on the neighbouring islands and re-export to all points round the Gulf, for whose firewood consumption the shores of the Clarence Straits form the natural store. Here, as at Bassidore, drinking-water is principally obtained from vaulted rain-water tanks. These tanks all along the coast line seem of one construction, being oblong or circular vaulted masonry reservoirs cut in the soil at the foot of slopes. At Luft fort, however, there are also several wells cut deep through the sandstone, and from which water is obtainable when the tanks are dry.

10. Leaving Luft I crossed the Straits for Khumeer to visit the sulphur mines which are dug in a hill about a fursac inland from that township. Specimens of the formation will be found among the collection made by Doctor Colvill. The works are some height in the seaward face of the mountain, and pierce into the strata in long irregular galleries. The ore is brought out in small pieces, which are piled conically in kilns. These are ignited, and the sulphur falls through an aperture into a receptacle immediately below the centre of the kiln, where it is crystallised, leaving a conical refuse of white lime or gypsum. The sulphur diggings are farmed by Muskat, and sublet to a sheikh for 4,100 krans. The sheikh further pays a sum of 2,400 krans in presents to the Persian authorities. The outlay of sulphur varies from 60 to 90 thousand muns of 9 lbs. The lime is said to be of an excellent quality, and fetches about 2 rupees for a thousand muns

of 9 lbs. when delivered on the sea-shore. The sheikh told me that he re-lets the diggings in numerous sections, and that his own profit amounts to about one kran on the Delhi mun of 28 lbs. of sulphur. Khumeer itself consists of a township and fort, very similar in dimensions to that of Luft; indeed, all the townships along this coast line may be described as a cluster of flat, oblong stone boxes round a tumble-down stone fort, and with an outskirting of temporary date-leaf huts. Several craft were lying on the beach of various sizes. Along this shore, as indeed, along all the shores of the Straits, are a series of slight fishing stakes, fixed at low-water mark, and formed of strips of the date leaves neatly tied together. Fish, with dates, and a little coarse barley bread, constitute the main food of the people. The fish most common and most relished is a large sort of mullet; soles and phamplet are caught, but do not seem to be much appreciated.

11. Leaving Khumeer the Straits widened to a breadth of about four miles, and on the Persian shore line a salt formation, apparently a continuation of that on the Island of Kishm, crops out immediately on the water line to a height of about 600 feet, and turns eastward, following the line of the Straits for about six or seven miles in a series of low hillocks of from 1 to 200 feet.

12. From the Straits I passed to the Island of Hormuz, visiting the ruins of the old Portuguese settlement. The fort, of solid masonry construction, is still standing, but is quite unrepaired. A few useless guns, bearing date the early part of the eighteenth century, lie about the bastions. Three sides of the fort are washed by the sea and the side facing inward is strengthened by a wet ditch cut entirely through the narrow neck of land on which the place is built. It seems that during the occupation of the Portuguese a small inlet of the sea on the eastern side of the fort had sufficient depth of water for vessels of considerable tonnage to lay immediately under the wharves. This inlet is, however, now filled up.*

* I find that along the Bunder Abbass shore line numerous creeks are silted up. To the northward on the contrary, for instance on the Bushire peninsula, and I believe also on the opposite Arabian coast, there are signs of the land being constantly caved away by the sea. Near the fort of Reshire the section of soil laid bare along the beach cliffs shows the *debris* of pottery for a considerable distance, and to a depth of 5, 6, or 7 feet. Some wells caved in still hang their sandstone apertures over the cliffs, and absolutely overhang the sea at high water.

13. The other side of the ditch forms the apex of the town, which stretched in an irregular triangular form along either coast line, and till it reached a range of hills, forming at once the base of the triangle and a natural wall of defence. The length of the perpendicular from the fort ditch to these hills may be about a mile and a half; while two towers still standing, at either extremity of the base, immediately above the beach, and marking the limits of the town, may be about two miles apart. The western of these towers still bears the name of Urgazee, and the eastern one that of Meshshateh. Outside the latter, and stretching south-eastward, seem to have been suburbs parallel with the shore line, and leading down to a pier distant three or four miles. This pier and suburb, which bear the name of Trompuk, are alleged to be still standing; but I had not the leisure to visit them.

14. It is impossible to guess what may have been the greatest extent of the city at any one time. Tradition, of course, asserts that it covered the entire extent above defined, but I infer rather that the original Persian settlements may have been those which now bear the above ancient names; that afterwards, perhaps, the Arabs on taking possession had their bunder at Trompuk; and that, finally, the Portuguese preferred the point where their fort now stands, because it was at once

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NOTE.—One is always going to see ruins in the East. Beyond the limit of our own territory, and excepting only a few emporiums created by the impetus given by us, Central Asia seems to have few towns that are not small and tumble-down, with extensive ruins and burial-places in the neighbourhood. The tombs are generally more numerous and costly than the dwelling-houses: no society seems ever to have flourished perennially; you hear the name of some king or hero, and are told of how happy and prosperous men were in his time; but he died, and all fell to pieces; these are the ruins! You hear of the splendour of Hormuz and the Portuguese, and here are their ruins! How comes it that neither under their own great leaders, nor when inoculated by the Portuguese and Dutch with the civilisation of the West, did Asia ever make a permanent start in material progress? Is it not because neither the kings nor the foreigners ever thought of the people? All were noble (Ashraff) or vile; all head and feet, but no body! If we can remedy this; if we can succeed in creating a great middle class in India, able to appreciate and accustomed to exercise their civil rights, and prepared to defend their foreign relations, let that be our monument. The most magnificent public works are at best but its fitting pediment. Then may coming travellers see, not ruins, but free and growing communities in increasing cities; and asking for memorials of the English, receive for answer——"Ære perennius siquæris monumentum circumspice!"

naturally protected, the nearest position to the old landing place on the mainland* which stood near the present Bunder Abbass,† and because, thirdly, it admitted of the closest approach of vessels of tonnage, and at all times afforded shelter on either one or the other side of the fort.

15. The description which old writers hand down to us of the splendour of Hormuz should, I think, be accepted with considerable care. For the period, it was doubtless a first-rate emporium, but would at present, perhaps, be considered an ordinary oriental town. There are no traces of any ruins of either great extent or solidity. The most durable structures seem to have been their vaulted water-tanks, which, of course, in a populous town wholly dependent on rain water, were both numerous and of vital importance. The statement of Justamond, ‡ that water was hawked about the streets on camels for the convenience of passengers, shows not that the town enjoyed an additional luxury, but that a necessary of life, which is elsewhere freely used, possessed a market value in this utterly desolate island. I find it also difficult to credit ‡ that the thoroughfares tramped by camels were likewise spread with carpets and linen, since such an arrangement would not accord with the personal habits of those animals. It is more probable that the old shops of Hormuz, like those of other eastern towns, were shaded by strips of awnings with bits of carpets for the transaction of business.

16. A local tradition alleges that the island of Hormuz was an appanage of the old Persian town of Minao, situated on the mainland on the banks of a fresh water river immediately east of Hormuz. Minao

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* Immediately opposite the Hormuz fort on the mainland, and about four miles to the eastward of the present Bunder Abbass, are the traces of a small ancient creek, now silted up; some masonry work is still visible. It is at this spot that goods are said to have shipped for or landed from ancient Hormuz. There are many traces of other small creeks along the shore line, one in particular close to Bunder Abbass, and which has silted up in the memory of man. It was probably the presence of this latter creek which caused the present bunder to be placed where it is, otherwise it would have been obviously much better placed some miles to the westward beyond Seroor, where a spit of land and the Kishm Island give much greater protection against the prevailing winds.

† Four miles east of Bunder Abbass.

‡ *Vide* extracts from Justamond and Ralph Filch, p. 30, Government Selection No. XXIV. of 1856.

still bears its old name, which is said to be derived from the words Min and Aub,—that is to say, land and water, *par excellence*. The fact is, as a merchant of Bunder Abbass said to me, that mankind settled in the first instance on fertile land and by the margin of sweet water; and wherever you find these two essentials in the neighbourhood of other ruins, you may be sure of their claim to the propriety of age.

17. As to the general character of the island of Hormuz, it seems to be very similar with that of the salt and sulphur formations in the neighbourhood of Khumeer, already described.

18. Leaving Hormuz I sailed across to Bunder Abbass, distant about 12 miles in a north-westerly direction, and forming a walled township with suburbs, along an open sea-beach, back grounded, at a distance of about 15 miles, by a range of lofty and apparently desolate mountains, although the clefts in the middle slopes of this range produce excellent oranges,* and are said to be otherwise studded with trees. Behind the present town are some large tombs of superior construction; they are falling into ruins. To the westward lie the *debris* of an extensive former town, and among them the ruins of an English factory, which seems to have been in the first instance pulled down to prevent its being used as a point of attack by any hostile force. A better and more sheltered position for a port lies about four miles to the westward, the entrance of the Clarence Straits, and which is said in the former times to have been the site of a small bunder. The present Bunder Abbass is destitute of any pier or other artificial improvement, has only from two to three fathoms of water at a distance of two miles out, and during the frequent southerly or south-eastern winds becomes a lee shore lashed by a heavy surf, rendering it necessary for craft to seek shelter under the islands of Hormuz and Kishm.

19. In regard to geographical position and freedom from interference of authority, Bunder Abbass appears to be the most favourable commercial position that I have seen along the shores of the Persian Gulf. I append an abstract statement of the trade, which has doubtless much increased during the past two or three years, and would be capable probably of much greater increase if industry were free and secure in the inland territories, for which Bunder Abbass is the natural port.

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* Some of the finest sort of oranges at Zanzibar are said to be grafts from the trees in this mountain range.

20. At present Bunder Abbass, with its adjacent districts of Minao and Khumeer, is farmed by the Sultan of Muscat at 16,000 tomans, equal to about £8,000 per annum, for a term of twenty years, eight or nine of which have expired. The treaty of lease is dated 1856. The Sultan in turn sublets the revenue and customs of these districts to a British Indian subject of the Khoja caste for about 25,000 tomans per annum, plus the expenses of administration, which may amount to 4,000 tomans more. It is assumed that the revenue from dates collected at Minao covers the 16,000 tomans payable to the Shah, and that the remaining 13,000 tomans, plus the profits of the contractor, are covered by the customs. The sulphur revenue from Khumeer is at present very trifling, since it does not compete in the Bombay market with sulphur brought from Europe, although the Khumeer sulphur is said to be of superior quality. The Sultan's Deputy Governor of Bunder Abbass is an Arab Sheikh, who seems an intelligent man, favourable to commercial interests. It is, indeed, remarkable that the Arabs, although in general civilization perhaps inferior to the Persians, are greatly preferred by foreigners as protectors and encouragers of trade. You may find British Indian traders settled at almost any Arab Port, but, in so far as I am aware, you will not find a single Hindoo or Khoja trading either at Bushire, Shiraz, Isfahan, or Tehran. There may be two or three at Yezd, which latter place is considered by foreigners the point least interfered with.

21. At Bunder Abbass there are some sixty Khojas, from thirty to forty Shikarpoory Bunias, and four or five Cutch Bhatias, being principally the Gomashtas or Agents of Sind or Bombay firms. They seem prosperous and contented, and complain only of difficulties incurred in collecting their goods and money from the interior.

22. So unsatisfactory indeed are mercantile transactions in the interior felt to be, that our British Indian subjects at Bunder Abbass limit their direct operations and business to the Bunder itself, or at the furthest Kerman and Yezd, where they have correspondents or commission agents, but no transactions seem to be entered into direct between our subjects on the sea-board, and the Persian subjects residing at Isfahan, or the capital. The rate of commission allowed has been 2 per cent. on sales, and the same on purchases; more recently the rate has been reduced to 1½ per cent.

23. I cannot find that any great trade is maintained between Bunder Abbass and Shiraz direct. Any trade that does take place in that direction is arranged for at the Bunder itself; the purchasers coming down from Lar, receiving the goods on credit, returning with them towards Shiraz, and thence coming back to Bunder Abbass with either goods for sale, or the money-value of their former transaction.

24. It is from the direction of Lar, however, that the donkeys, which form the principal means of carriage towards Yezd and Kerman, are brought. During winter indeed camels are used; but it is said that these are unable to support the heat of the plains in summer. A donkey is sufficiently hardy for all seasons. He carries about 220 lbs. and is content with the desert grass and very little corn. All carriage however, seems to be charged for by the weight, a Bunder maun * of 9 lbs. coming on an average half a kran to Yezd, and one-fourth kran to Kerman.

25. The rate of customs duty at Bunder Abbass is determined by the terms of our commercial treaty † with Persia; under that treaty English goods are liable, whether when imported or exported to *ad-valorem* duty of 5 per cent. Bunder Abbass being farmed to Muscat, while goods passing there are principally of Persian produce or for Persian use, it has been arranged that the total duty of 5 per cent. shall be proportioned, $1\frac{1}{2}$ per cent. to the authorities at Yezd, and $3\frac{1}{2}$ per cent. as customs at Bunder Abbass. Persians since 1856 enjoy, I believe, some reduction of these rates.

26. The merchants at Bunder Abbass seem to take little interest in the question of the localities where their goods may eventually find a retail sale in the interior; but, so far as I can gather, all goods sent

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* There are five Mauns.
The Hashem Maun of 124 lbs.
The Tabreez Maun of $6\frac{3}{4}$ lbs.
The Bushire Maun of $7\frac{3}{4}$ lbs.
The Bunder Abbass Maun of 9 lbs.
The Delhi Maun of 28 lbs.

It is possible that the Bushire, Bunder Abbass and Tabreez Mauns were originally of the same weight, and that light weight, what is called the stone, being lighter, is the secret of the present difference.

† The Persian Flag flies at Bunder Abbass, and is in official correspondence with the Persian Authorities in the interior. Nearly all the matters upon which our subjects applied to me related to transactions with the interior of Persia.

to Yezd, and not consumed in the neighbourhood, find their way towards Isfahan, and probably compete with the Tabreez and Shiraz and Bushire trade on the Tehran line. To this rule, however, there is at present one exception. Sugar, which used to be imported from Batavia or Mauritius *viâ* the Persian Gulf for refinement at Yezd or other Persian markets, is now unable to compete with the so-called Russian, but probably in reality, French Beetroot loaf Sugar imported *viâ* Tabreez.

27. So far as I can ascertain only one caravan per annum of three or four hundred animals comes from the north-east of Khorasan, *viâ* Berjoon and Kerman, bringing silk, carpets, and miscellaneous articles. The road through Khorasan, as far south as Yezd or Kerman, is considered unsafe, owing to Belooch or other plunderers, but from Yezd and Kerman to Bunder Abbass little danger is apprehended. The carpets brought from Berjoon are very similar in make and pattern with those which are commonly called Persian carpets. They contain, however, more cotton and less wool, are adapted to the Persian taste, and principally exported to Yemen*.

28. Apart from the date trade of Minao already alluded to, and a trade in mats from the same district, (mats sometimes used by us in India in lieu of China matting,) Bunder Abbass seems to have few commercial dealings eastward along the coast line towards Mekran. The province extends indeed some twenty fursacs beyond Koh-i-Moobarek near Cape Jask, and the Sheikh has a fort in that direction, but perhaps 2,000 tomans per annum collected as date revenue from the Belooch tribes along that shore, and another 2,000 tomans collected from dates and fruits in the districts between Minao and Bunder Abbass, are all that is collected from all to the eastward, and these 4,000 tomans are considered as covering to the customs contractor, including cost of collection.

29. As to population Bunder Abbass and its neighbourhood may contain 8 or 9,000 inhabitants, but a portion of this number being muleteers and carriers fluctuate of course daily. I do not find that at present any very large caravans start together. Formerly, when the

* By far the finest carpets I have seen in Central Asia were those at Herat. They were of hair or wool throughout, and very durable. Those of Kerman in web and woof are of wool and cotton respectively.

roads were less safe it is said that caravans of from 1 to 2,000 animals with armed attendants left simultaneously, but now parties of 50 to 200 start as soon as their goods are ready for loading.

30. On the whole the sketch of Bunder Abbass given in my previous letter, as per margin, seems to me tolerably correct, and on any details in which my opinion may have been modified by personal observation, that modification is in favor of Bunder Abbass.

No. 67, Political Department, dated 13th April 1863.

31. The merchants opened to me on the question of having a steamer of their own. They think if a steamer could be run with freight at—as 3 Rupees against the Buglas—2 Rupees, the steamers would soon drive the Buglas off the sea.

I have the honour to be, &c.,

(Signed) LEWIS PELLY, Lieutenant Colonel,

Acting Political Resident, Persian Gulf.

STATEMENT of the Annual IMPORT *and* EXPORT *Trade of Lingah.*

Names of Articles.	Imported from India.	Transhipped to the Oman Coast.	Sent to the Interior.	Balance consumed.
Piece Goods	600 bales.	300	50	250
Sugar	300 bags.	100	100	100
Sugar Candy	100 casks.	50	10	40
Coffee	2,000 bags.	1,500	50	450
Rice	1,00,000 do.	67,000	....	33,000
Iron	250 tons.	150	50	50
Lamp Oil	400 dubbas.	300	....	100
Pepper	450 bags.	350	....	100
Ginger	200 do.	150	....	50
Turmeric	300 do.	200	....	100
Cinnamon	50 boxes	30	....	20
Cloves	20 bags.	15	....	5
Cardamoms	600 lbs.	450	....	150
Indigo	25 cases.	18	....	7
Chinaware	60 boxes.	40	....	20
Specie	20,000 rupees.	20,000	....	....
	Brought from the interior.	**Exported to India.**	**Exported to Jedda.**	
Tobacco	9,000 maunds.	....	8,000	1,00
Almonds	22,000 do.	20,000	....	2,0
Roses (dry)	1,200 do.	1,000	....	200
Cummin Seeds	2,500 do.	2,000	....	500
Cotton	6,000 do.	6,000	....	....
	Country produce.			
Wheat	2,00,000 maunds.	....	....	2,00,000
Barley	75,000 do.	....	....	75,000
Dates	20,000 do.	....	....	20,000
Pearls and Specie exported from Lingah and the Oman Coast to India amount to about	10 Lacs Rupees.	....	....	....

A Lingah Maund contains 9 lbs.

STATEMENT of EXPORTS *and* IMPORTS *of* BUNDER ABBASS.

IMPORTS.			IMPORTS.		
From Bombay.			Tabasheer (drug)..	4	casks.
Piece Goods.....	2,164	packages.	Rice.....	1,387	bags.
Ditto.....	460	bales.	Tin.....	325	pieces.
Ditto.....	220	boxes.	Copper.....	54	do.
Cotton Yarn.	770	packages.	Turmeric.....	34	caskets.
Mussulipatam Chintz.....	86	boxes.	Do	59	bags.
Cashmere Shawls..	7	packages.	Camphor.....	3	boxes.
Sugar.	9,507	bags.	Preserves.....	15	do.
Sugar Candy.	5,606	casks.	Khosroodar (drug).	28	bags.
Alum.....	116	do.	Twine	26	packages.
Ammonia.....	5	do.	Untwisted Silk Thread	750	lbs.
Iron Roasting Pans.	14	candies.	Nails	1	cask.
Kuttahindy.....	61	bags.	*From Kurrachee.*		
Cocoanuts.	86	do.	Indigo	482	packages.
Steel.....	161	casks.	Ammonia.....	293	do.
Pepper, Indian....	639	bags.	Leather, Patent...	125	do.
Do. Java.....	236	do.	Hides	750	pieces.
Ginger.	193	do.	Oil	23	dubbas.
Tea.	2,104	boxes.	Shawls, Cashmere	1	parcel.
Cinnamon.	1,128	do.	Chintz.....	1	box.
Chinaware	171	do.	*From Muscat.*		
Crockery	30	do.	Rice	190	bags.
Glass.	9	do.	Sugar Candy	111	casks.
Cochineal.....	6	do.	Sugar.....	175	bags.
Jedva (drug).....	20	bags.	Cheshmizeh (drug).	2	do.
Tamarind, Guzerat..	9	boxes.	Kondor (drug)	3	baskets.
Do. Indian ..	348	baskets.	Piece Goods	660	pieces.
Paper and Books ..	25	boxes.	Ginger.....	6	bags.
Haleila (drug).	1,228	baskets.	Jedva (drug).....	5	do.
Cardamoms	17	bags.	Dry Limes	1,175	mds. of 9 lbs.
Iron	1,612	pieces.	Ammonia.....	3	boxes.
Indigo.....	15	packages.	Oil	12	dubbas.
Glass shades.....	1,052	number.	Alum	6	bags.
Zinc.	358	pieces.	Tin	22	pieces.
Cassia Tistulæ.....	30	baskets.	Coffee	14	bags.
Chesmizeh.....	31	bags.	Pepper.....	245	do.
Coffee	21	do.	*From Jeddah.*		
Oil.	12	dubbas.	Rice.....	625	bags.
	21	casks.	Gum, Mastic....	1,910	mds. of 9
China roots.....	9	boxes.			

Exports.		Exports.	
To India.			
Almonds.....	71,984 mds. of 9 lbs.	Asparagus.....	248 mds. of 9 lbs.
Dry Roses.....	9,590 do.	Pestachia Nuts.	2,530 do.
Madder Roots.	1,47,880 do.	Cotton	10,245 bags of 9 lbs.
Raisins.....	7,189 lds. of 20 mds.	Wool	34,805 mds. of 9 lbs.
Kishmish.	7,156 mds. of 9 lbs.	Cummin Seeds.	18,572 do.
Carpets.	3,125 pieces.	Silk, raw.....	1,554 do.
Sulphur.	2,680 mds. of 9 lbs.	Lead	360 do.
Walnuts	783 lds. of 20 md.	Gram	854 lds. of 20 mds.
Assafœtida....	4,395 packages.	Pulse	65 do.
Down (kork) ..	5,002 mds. of 9 lbs.	Saffron	29,900 miskals.
Bozghoon (dye)	1,652 do.	Onnab (drug)..	66 mds. of 9 lbs.
Oshtorak		Piece Goods.	
(gum).	482 mds. of 9 lbs.	(Yezdy).....	46 packages.
Tallow.	45 skins.	Opium.....	107 cases.
		Plums (Aloo).	1,938 mds of 9 lbs.
		Tobacco.....	6,658 bags of 5 mds.

This statement is derived from good authority; but I am of opinion that all the items are understated, and that the actual trade of Bunder Abbass may be about from twenty-five to thirty per cent. in excess of that shown in this statement.

(Signed) Lewis Pelly, Lieut. Colonel,
Acting Political Resident, Persian Gulf.

16*th January* 1864.

To Lieut. Colonel Lewis Pelly,

Acting Political Resident, Persian Gulf.

Bushire, 15*th January* 1864.

Sir,—I do myself the honour to forward specimens of some minerals collected on the Island of Kishm, the adjoining mainland, and the neighbouring island of Ormuz.

The Island of Kishm, 60 miles long, runs nearly East and West, and is composed almost entirely of sandstone and marl. On the south side of the island those rocks dip south at an angle of 25° and on the north side dip north at about the same angle. Kishm No. 1, 2, and 3, are specimens of the strata from above down.

Salt hills occupy a part of the island near the middle, and extend from the southern side nearly half way across (*see* sketch opposite).

Those hills cover an area of about 25 square miles. They are from two to five hundred feet high, and though at present divided by narrow and deep ravines, they have every appearance of having been originally one solid mass; for the layers of salt are horizontal, and one ravine may be seen at present in the process of formation. This is a cave some hundred and fifty feet high, with the bed of a stream running through it towards the sea. The roof is continually falling in, and from being an enormous cave it will become in time a small ravine.

While the salt was being dissolved from the surface, the impurities were left, and now cover the tops of the hills, as thatch does a house, and supposing no earthly deposits to have been originally on the top of this mass, the stratum, judging from the amount of thatch, must have been three times as thick as the hills are at present high.

Kishm No. 4 contains fragments from this covering. The layers of salt are horizontal. Some are tinged green, and yellow by sulphur (No. 5), while others are brown, red, and pink (No. 6). Those are only one inch or so thick, and alternate with pure salt in strata of from 6 inches to a foot and a half in thickness.

These hills, as they at present stand, are one-third higher than any other hills on the island, and for 5 miles they lie along the sea beach, so that it is impossible, if things have always been in their present position, that the salt could have been formed by a simple deposition from water.

There, and also on the island of Ormuz amongst the salt, and confined to it, is a rock (No. 7), blue in colour, and without any distinct stratification, which appears very much like the marl of the rest of the island, that has been exposed for a long time to a temperature sufficient to consolidate but not to vitrify the particles.

On the mainland north from Luft, and near the sulphur caves of Cameer, is a hill of rock-salt, abutting against a sandstone range, and bordering on the shore.

Opposite the island of Kishm near Cameer, in the midst of sandstone and gypsum, is a vein of sulphur (No. 8), about one foot and a half in thickness, running through the gypsum, and near it is a red clay used for fictile purposes (No. 9).

On the island of Ormuz, besides the rock-salt, sandstone and marl found at Kishm, there are in the marl many crystals of iron pyrites (No. 10), and also a red mineral (No. 11) used for dying; and the surface of the ground is sprinkled with a salt of alumina (No. 12).

I have the honour to be, &c.

(Signed) W. H. COLVILL,
Civil Surgeon.

(True copies)

(Signed) C. GONNE,
Officiating Secretary to Government.

ART. XVI.—*Report on the Result of the Observations and Enquiries made during a Tour in the various Countries around Zanzibar, especially those more or less connected with the Slave Trade. By Lieutenant Colonel* R. L. PLAYFAIR. *Presented by Government.*

[Read before the Society, 19th May 1864.]

I have the honour to report for the information of His Excellency the Governor in Council that, impressed with the importance of making myself well acquainted with the various countries around Zanzibar, especially those more or less connected with the slave trade, I left Zanzibar on my projected tour on the 8th of October.

2. I had intended proceeding at once to the south in the "Pleiad," but Commander Chapman, R. N., who purposed leaving on the same day for Pemba, invited me to accompany him in H. M.'s S. "Ariel." I gladly availed myself of his kindness, and sent the "Pleiad" to await my arrival at Ibo.

3. We anchored off Chak-Chak, the principal port of Pemba, on the morning of the 9th, and left on Sunday the 11th. These two days were occupied by the ship's boats in searching the numerous creeks and harbours for slave dhows, and by Captain Chapman and myself in visiting the main and adjacent islands.

4. Next to Zanzibar, Pemba is the most considerable island in the dominions of His Highness Seyed Majid, and produces large quantities of rice, manioc, fruits and vegetables. It is cut up in every direction by creeks, which are much frequented by country craft engaged in the slave trade; while owing to the numerous reefs and shoals, and to the imperfect survey of the island, they are quite impracticable for vessels of war; no slaves were found on this occasion.

5. It is more unhealthy than Zanzibar, and the mortality from fever is so great, that it is a question whether it could be kept under cultivation were the supply of slave labor cut off.

ROUGH SKETCH OF THE EAST AFRICAN COAST,
to illustrate
LIEUTT COLONEL PLAYFAIR'S TOUR.
PORTUGUESE POSSESSIONS
POSSESSIONS OF SULTAN OF ZANZIBAR
BARBARIA I.
COMORE
MOMBA
MAYOTTE

6. The vegetation is most luxuriant, the numerous islands which fringe its western coast are uncultivated and uninhabited, save by fishermen and runaway slaves, and there one can wander in the deepest shade through virgin forests, which would be esteemed a botanist's paradise. I collected a considerable variety of orchids, which I shall send by the first opportunity to the Victoria Gardens.

7. The main island is less cultivated than Zanzibar, but it appears, if possible, more productive, and its fruits, especially the mango, are more highly esteemed. Sugarcane is grown in considerable quantities, but the method employed for extracting the juice is so rude, that but little sugar, and that of a very inferior quality, is produced.

8. We next intended visiting Kilwa, but owing to the strong baffling currents which prevail on this coast, the Captain misjudged his position, and on the 15th October we found ourselves entering Kiswara bay, under the impression that it was Kilwa. With the exception of a few fishermen we saw no sign of habitation, and the shore, where we landed, was so densely overgrown with jungle that we were unable to penetrate it.

9. Thence we proceeded to Tonga bay, immediately to the South of Cape Delgado. We anchored at 8½ P. M. on the 16th, and next morning we visited the village of Tonga, the most southern possession of His Highness Seyed Majid. It is in actual possession of His Highness, who has a Custom House there, but it is also claimed by the Portuguese. In a statistical account of Mozambique, published by the authority of the Portuguese Government,* it is stated,—"Cape Delgado is the northern limit of Mozambique ; nevertheless the Imaum of Muscat has a Custom House in the bay of Tonga, to the south of that Cape, which must be abandoned as soon as we shall assert our undoubted right to the possession of that place."

11. We arrived at Ibo or Weebo (where I found the "Pleiad" awaiting me) on the morning of the 18th; this is one of a numerous group of islands, to the south of Cape Delgado, and capital of the district of the same name. It contains nearly three thousand natives, but very few Europeans. There are twelve Banian merchants, and one

* Ensaios sobre a Estatistica dos possessoes Portugezas no ultramar, II Serie, Sjb: IV Mozambique.

Frenchman, representing the well-known firm of Regis Aine of Marseilles, a house once deeply engaged in the slave or "free-engage" trade.

12. The town is clean, and the houses, though poor, are neatly built and kept, but its aspect is most depressing, the Governor assured me that it had an important trade in ivory, copal, &c., but assuredly one could not divine this fact from the appearance of the town. There were very few dhows in harbour, no signs of life or commercial activity in the streets, the European and half-caste population appeared to a man to be miserable, fever-stricken wretches, and the only signs of work I observed were the processions of prisoners or refractory slaves engaged in carrying building material for the public works in course of construction.

13. There are three ports, the principal of which I inspected. It is kept in good repair, and serves as barracks for the garrison. As a defensive work against any European enemy it is contemptible, but it appears well adapted for resisting the natives, between whom and the Portuguese, all along the Mozambique coast, perpetual hostility appears to exist. The armament consists of a few old and rusty guns of a calibre, varying from 3 to 12 pounds, some with the broad arrow and royal cipher of England, others with the fleur-de-lis of France, but none with the arms of Portugal; these are mounted on the flat, terrace roof of the fort, which being simply composed of chunam plaster over slight wooden rafters, is quite unfitted to resist heavy firing.

14. From Ibo I proceeded to Mozambique, where I arrived on the morning of the 21st, and remained till the afternoon of the 26th. I met with a very hospitable reception from the Governor General, Brigadier Joao Tavarez de Almeida, who invited me to reside at the palace and from one of the principal merchants of the city with whom I spent two days at his villa on the mainland at Cabaciera.

15. The city of Mozambique is situated on a sandy island, about a mile long, and 300 paces broad. I was prepared by the report of Captain Crawford, R.N., quoted in the last Blue Book on the slave trade* to find it "a heap of ruin," but I was agreeably surprised to find it clean and solidly built. The houses of the Europeans are large,

* Class B. correspondence with British Ministers and Agents in foreign countries, &c., relative to Slave Trade, from January 1st to December 31st 1862, presented to both Houses of Parliament, p. 186.

double-storied buildings, in excellent preservation, many of them superior to the best at Zanzibar. The public buildings are equally good, especially the palace of the Governor General, once the Jesuit college of San Paulo, which may fairly claim to possess a certain amount of magnificence.

16. There is no good water on the island, but many of the houses are provided with large subterranean reservoirs, which are filled by the rain water collected on the flat terraced roofs. These cisterns are 42 in number, and are capable of containing from one to 53 thousand cubic feet of water.

17. There is a large fort on the north point of the island (San Sebastian) the construction of which is attributed to Don Joao de Castro. It has four faces, two of which command the approach to the harbour, and two the length of the island. It contains some very curious old brass ordnance. Its walls, though impregnable to a native attack, would soon crumble beneath the fire of modern artillery.

18. There are two other smaller works, intended to command the passage between the south end of the island and the main, but they are small and rather intended for police purposes than for defence.

19. The garrison of the city is small, the military force of the province being distributed in numerous detachments along the littoral and in the interior. It consists both of Native and European troops, the latter being exclusively deserters and incorrigibles from the European army.

20. The population of the island is under 5,000, of whom not more than 80 are Europeans, and two hundred country-born, soldiers not included.

21. The island is quite sterile, and it is with difficulty that a few stunted Banian trees are grown, but on the mainland there are several villas surrounded by plantations where manioc, cereals, cocoanuts and fruit are produced in considerable abundance. At present the growth is dry and parched, and the only crop in season is the cashew-nut, from the fruit of which large quantities of spirit are produced.

22. All affairs connected with the semi-independent natives are conducted through the medium of an Officer called the Captain-Major of the mainland, whom only the natives recognize, but even his power over them is very limited, and it appears to me that the Maconas of

the interior are as independent as if no Portuguese settlement existed on the coast.

23. It is not my intention to enter into a detailed history of Mozambique, but I may be permitted to narrate very briefly the most salient incidents connected with the colonization of this province by the Portuguese.

24. The squadron of Vasco de Gama visited the Quillimane river in November 1498, and in March following it touched at Mozambique, where a few Arab traders from the Red Sea were found engaged in trading for gold and ivory. It subsequently visited Mombassa and Melindo, where it procured pilots who took it to India. Vasco de Gama touched at Sofalla on his second voyage, and afterwards induced the Chief of Kilwa to become tributary of Portugal. A fort was erected here by Almeida, the first Viceroy of India in 1505, and in the same year the first Government of the East African Coast was instituted under the title of the Captaincy of Sofalla.

25. In 1508, a fort was built at Mozambique, and the entire Portuguese possessions in the East were divided into three Governorships, of which one extended from Cape Corrientes to Cape Guardafui.

26. In 1569, three ships with 1,000 armed men, of whom many were nobles, and all volunteers, sailed from Portugal for the conquest of the gold mines. The expedition ascended the Zambazi as far as Sena, but the natives exasperated at the cruelties inflicted on them, so harrassed it, that it was compelled to retire. It subsequently reached the gold mines from Sofalla, but the party were so disgusted at the small returns which an infinite amount of labour produced, that they speedily abandoned them.

27. In 1585, the Turks made a descent on Zanzibar and its coasts, killing many Portuguese, but a fleet from India brought speedy retribution and destroyed several towns with all their inhabitants. The Turks made a second descent in 1589, and were well received at Magdeshooa. An armada sent against them found the Turkish fleet at Mombassa and destroyed both the ships and the town, and having made an example of the Chiefs who had assisted the Turks, it returned to India.

28. In the beginning of the 17th century the Dutch pirates appeared in the seas of Eastern Africa, and blockaded Mozambique in 1607 and 1608, on both of which occasions they were repulsed.

29. In 1609, the first Governor of the whole coast landed at Mozambique, and three years afterwards the Ecclesiastical Government of the district was severed from that of Goa.

30. In 1645, the exportation of slaves to Brazil commenced in consequence of the kingdom of Angola having fallen into the hands of the Dutch. In 1649, the English commenced to trade on the East Coast of Africa; in the following year the Portuguese lost Muscat; in 1651 the Dutch established themselves at the Cape, and in 1655 the French erected a factory at Madagascar, so many steps towards the ruin of Mozambique.

31. In 1671 the monopoly of trade was taken from the Governor of Mozambique, and thrown open to all Portuguese, and in 1687 Banians from India made their first appearance as traders.

32. Mombassa fell into the hands of the Arabs in 1700; in 1725, it was once more taken by the Portuguese, and with it the island of Zanzibar, but four years subsequently these possessions were lost to them for ever.

33. At this time the Dutch first set foot in East Africa, the establishment they formed at Lorenco Marques in 1721 was destroyed by English pirates in 1733, nor were the Austrians, who built a factory at the same place in 1778 more fortunate, being driven out two years afterwards by a military force sent from India.

34. A decree of the 19th April 1752 separated the Captaincy of Mozambique from the Government of Goa, and the Lieutenant-Governor took the title of Governor and Captain-General of Mozambique, Sofalla, the rivers of Sena, and the whole coast of Africa, and its Continent, from Cape Delgado to Lorenco Marques.

35. By 1775 a fort, barracks, prison, magazine and church were completed on the mainland opposite Mozambique, and early in the following year the whole were destroyed by the natives, who plundered everything, burnt the houses, and killed such of the inhabitants as did not escape by timely flight.

36. During the next few years the country suffered much from the rapacity of its own Governor and from commercial competition with the French, who had established a factory at Kilwa. European and Arab pirates made repeated attacks on all points, rendering interior

trade unsafe, while repeated applications to the parent country for assistance were treated with neglect. At Inhambane, the Governor and all the inhabitants, with the exception of ten, were murdered by the natives; in 1834 and in 1836, a similar tragedy was only avoided by the accidental presence of an English vessel of war. The Captain-Major of the mainland of the district made an attempt to avenge these outrages, and with a few soldiers and friendly natives went to meet the Zulus, and give them battle; not a single man of the Portuguese remained alive upon the field.

37. Shortly afterwards Mozambique was blockaded by two English brigs of war, in consequence of the Governor having failed to carry out the convention for the suppression of the slave trade. The new Governor Mavimbo strove hard to abolish this infamous traffic, but he met with the most determined opposition from the inhabitants of the city, the public officers included.

38. During the past ten years there have been repeated risings of the blacks against the whites, and even of the troops and inhabitants against the authorities. Communication with Sena and Lete has frequently been interrupted. Sofalla, Inhambane and Lorenco Marques have suffered all the horrors of war and intestine disorder, Quillimane was depopulated by famine, and Mozambique has been ravaged by disease and hurricanes.

39. The heavy duties and obstructive fiscal arrangements of the Portuguese have almost annihilated trade, and until very lately no traffic but that of ivory and slaves was deemed worthy of attention. Thanks to the energetic measures of the British Government and its cruisers, and I firmly believe to the uprightness and loyalty of the present Governor-General, Colonel Joao Tavarez de Almeida, the slave trade has greatly decreased, though the desire to participate in its unholy gains remains unabated.

40. It is difficult, especially for a British official, to obtain correct information on this point, but it is commonly believed that two European vessels have succeeded in obtaining cargoes during the past twelve or fourteen months, while small numbers of slaves are constantly taken away by dhows, touching at unfrequented parts of the coast. One Spanish vessel, the "America" is now supposed to be watching for an opportunity to obtain a cargo. I left her at Zanzibar, she had previously

remained some weeks at Mozambique, and she appears to be spending time under the pretext of legitimate trade till her consorts arrive. She was carefully searched by the Governor-General, but no conclusive proof of her character was obtained. I cannot refrain from recording that it was His Excellency who first communicated to our naval officers the fact of her presence on the coast, and his suspicions regarding her.

41. I do not entertain a doubt that His Excellency is sincere in his desire to prevent this execrable traffic, but he met with no support from his subordinates. In the Blue Book before quoted there is a correspondence on the subject, and in one of his despatches (pp. 185-6-7) he indignantly denies that his subordinate officers are in any way concerned with it at the present day, whatever might have been the case formerly.

42. This despatch is dated 15th February 1862, but in conversation with me, His Excellency frankly admitted that had his information been as correct then, as it is now, he would have modified his language considerably.

46. Slavery is sanctioned as a domestic institution, and I believe, that with the single exception of the Governor-General, there is not a man in the province who has a free servant. As the law now stands, all slaves are to become free in 1878, but whether this will take effect without considerable exterior pressure is very doubtful.

47. My short residence at Mozambique does not enable me to speak authoritatively of the state of the domestic slaves. I was told that they were generally well treated; nevertheless I was forcibly struck with the difference between them and those at Zanzibar. The latter are the gayest and happiest class of the community, continually dancing and singing, for two days in the week they are allowed to work for themselves, and their manner is free and unconstrained. Here they never meet an European without making the deepest reverence, they address their masters with bated breath, and appear to stand in the greatest awe of them. It is true that a master may not, by law, beat his slave, but he may send him to the Police to be beaten, or he may sentence him to imprisonment with hard labour in irons on the public works, without cause shown before any legal tribunal.

48. The following is a statement of the revenue and expenditure of the province for 1857-58, since when there has been an improvement, but not I believe to any very great extent:—

Expenditure.

General administration	$	26,758	
Administration of trade	„	17,092	
Do. of justice	„	1,599	
Do. of the church	„	4,544	
Do. of army	„	58,278	
Do. of navy	„	17,300	
Do. of customs	„	5,919	
Sundry charges	„	7,650	
Total			1,39,140

Revenue.

Direct taxes	$	9,626	
Indirect do	„	75,443	
Other sources	„	3,860	
Total			88,929
Deficit	£	50,211	

49. I left Mozambique on the 26th October, and arrived at Mayotta on the morning of the 1st November. I do not intend giving any detailed account of the Comoro islands, that has already been done by Lieutenant Colonel Pelly, but a few observations on points passed over by that Officer may not be amiss.

50. As a colony, Mayotta has certainly not fulfilled the expectation the French expressed at the time of its occupation, notwithstanding the unusually liberal terms held out to colonists;—the unhealthy nature of the climate, and the want of an adequate supply of labour have combined to deter capitalists from settling in this island. The French are not good colonists, and foreigners are shy of placing themselves under a Government, which, though not illiberal, legislates so particularly for the benefit of its subjects, as materially to interfere with their liberty of action.

51. There are eleven sugar plantations in operation, which are said to yield a total quantity of 3,000 tons per annum, but there is reason

to believe this that estimate is very much exaggerated. Nothing but sugar is exported, and the supply of food grown in the island is insufficient for the use of the inhabitants, so that the total produce of the island may be estimated at £40,000 per annum.

52. Land is freely conceded to intended settlers at half a dollar per acre, for the first 98 acres, and one dollar is paid for every acre taken in excess of that quantity. No land tax is demanded during the first three years of occupation, but after that period half a franc per annum is charged for each acre. The port is free, and no other taxes are levied, if I except a nominal one of 25 francs for every dog kept; this, though law, has never been enforced.

53. The annual expenditure is about 1,50,000 francs, while the receipts on account of the land tax realize only 9,000 francs, leaving a deficit of 1,41,000 francs to be paid by the imperial treasury.

54. The approximate population is—

Europeans and Creoles	Males	12
Ditto	Females	8
Arabs, Comoros and Malagash		10,000
Negroes		3,000
	Total	13,020

exclusive of troops and Government officials. The proportion of females to males is as one to five.

55. The garrison consists of

European Marine Artillery	80
Ditto Infantry	50
Native local troops	100
Police	20
Total	250

56. The labourers on the sugar estates are principally negroes, who are imported from the adjacent islands and from Madagascar as "free *engagés*." Whatever name may be given to the system by which they are procured, it is simply and undisguisedly a phase of the slave trade. Thus a planter desirous of obtaining a supply of labourers applies to the Commandant Supérieur, who appoints a delegate (invariably a private

soldier of the garrison) to accompany him, say to Mohilla. There the necessary number of *slaves* are purchased from Arab dealers, they are then liberated and bound to serve their new masters for periods of not less than three, and not more than five years. The average price paid for the slaves is £35, and by the time they are landed at Mayotta as "free engagés" they cost about £40 per head. Their master is bound to pay them £1½ *per mensem* as wages, and to allow them a weekly ration of 12lbs. of rice with a small quantity of salt and butter.

57. These negroes are usually, if not always, brought by Arabs from the mainland of Africa to the various islands, whence they are shipped to Mayotta; they are then *bonâ fide* slaves, and it is certain that their purchase by the French, even though by this fact they become transmuted into "free engagés," fosters and tends to perpetuate the slave trade. I do not propose any remedy for this, I merely state facts which no colonist at Mayotta will dispute.

58. I left Mayotta on the 3rd of November, and arrived at Pomoni in Johanna on the following morning; during the passage we met a boat at sea containing seven "free engagés," who had fled from Mayotta in their master's boat; they were in great distress, and owing to adverse winds and a high sea, it seemed doubtful whether they could reach their destination. They were received on board the "Pleiad," and the boat was made over to Mr. Sunley, Her Majesty's Consul at Johanna, to be returned to its owner.

59. These men called themselves slaves, and evidently had failed to appreciate their altered condition as "free engagés"; they said that they preferred death to returning, and as they were found on the high seas, I did not feel myself called on to restore them, even had I possessed the power to do so.

60. Colonel Pelly has left me little to say regarding this island, but I cannot refrain from adding my testimony to his regarding the marvellous results which the skill and energy of Mr. Sunley have produced, and the humanizing effects on the population which have followed.

61. He has already three hundred acres of land planted with sugar-cane, which produce upwards of three hundred tons of sugar *per annum*.

62. Unfortunately he has been compelled to employ slave labour, but in so mitigated a form as to rob it of all its horrors. The importation of slaves into the island has long ceased, it received a temporary stimulus from the *engagé* system, but that was of short continuance. The institution of domestic slavery of course prevails, and the climate of the island, unlike that of Zanzibar, Mozambique, &c., is so congenial to the African constitution, that the births pretty nearly equalize the deaths, thus the supply of slave labour is perpetuated.

63. Mr. Sunley hires these domestic slaves from their masters, paying the latter $1\frac{1}{2}$ per mensem, and a further allowance of from half-a-dollar to two dollars, together with food and clothing, is made to the slaves themselves. Out of the 230 men in his employment not more than 50 are free men.

64. Her Majesty's Government deemed it impossible that a British Consul could be permitted to employ slave labour in any form, and Mr. Sunley was given to understand that he must employ free men only, or resign his Consulate. He had sunk all his capital in the enterprize in which he is engaged, and finding it impossible to continue it without the assistance of slave labour, he has accepted the latter alternative.

65. The loss to him is insignificant, his remuneration as Consul is only £150 *per annum*, while his sugar plantations yield ten times that amount, but the loss to the public service will be far more serious.

66. Mr. Sunley's long residence here, and his sterling qualities have given him an influence in the councils of the King and his Chiefs, such as few Consuls succeed in attaining, that has always been used for good, and the result is that the island once noted for disaffection to its ruler, and for the intestine feuds amongst its Chiefs, has enjoyed uninterrupted tranquillity.

67. On the 9th of November, in company with Mr. Sunley, I steamed round to Mootsamoodoo, the capital, to pay my respects to the King. I was much pleased with His Highness, who appears to be a young man of considerable intelligence, and a fair English scholar. He begged me to remind Her Majesty's Government that he has as yet received no compensation for his dhow, which was improperly destroyed by H. M.'s S. "Gorgon," two years ago, within sight of the island. Mr. Sunley informed me that his statement was quite correct, and that he had reported the facts of the case to the Foreign office, but has received no reply.

68. Nothing at Johanna surprised me more than to see a people of Arab descent, entirely ignorant of Arabic, and for the most part speaking English with fluency and accuracy. With their native tongue (for the Johanna language is of recent formation) they seem to have laid aside many of the prejudices of Islamism. Their women, though generally secluded, are not absolutely so. His Highness introduced me to his three wives, and in another family which I visited, I was received by the unmarried daughter of the house, a girl of about sixteen, betrothed to the King's brother, and sister of His Highness's third wife.

69. His Highness is much annoyed that two of his relatives (one of them Prince Abdulla, *alias* Abadoo, *alias* Aboodeen of Indian notoriety) have proceeded to England, with the intention of prosecuting the career of imposture Abadoo so successfully practised at Bombay, Madras, and Ceylon. I presume that his previous career is as well known in England as in India, and that they will meet with no recognition or assistance from Her Majesty's Government.

70. I left Johanna on the morning of the 10th instant, and returned to Zanzibar on the 14th.

I have the honour to be, &c.,

(Signed) R. L. PLAYFAIR.

(True Copies)

H. L. ANDERSON,

Chief Secretary.

ART. XVII.—*Visit to the Wanika Country in the vicinity of Mombassa, and the Progress made by the Christian Missionaries at that place.*—By Lieut. Colonel R. L. PLAYFAIR, H. M.'s Consul and Political Agent at Zanzibar. *Contributed by Government.*

[Read before the Society, September 15th, 1864.]

I HAD long proposed to myself a visit to the Wanika country in the vicinity of Mombassa, where our Missionaries are settled, in the hope that my presence amongst them would strengthen their hands in their dealings with the provincial authorities of his Highness Seyed Majid, and with a view to make myself more intimately acquainted with the extensive districts under my political control. During the first two months of this year illness prevented my leaving Zanzibar, and after my recovery the *Pleiad* was absent at Seychelles. I was therefore very glad to accept the kind offer of Captain Gardner to convey me to Mombassa in the frigate under his commad.

We left Zanzibar in H. M. S. *Orestes* on the 26th ultimo and anchored at Mombassa on the morning of the 28th idem. The University Mission to the Zambesi under Bishop Tozer has lately been broken up, and I found two members of it—the Rev. C. Alington and Mr. Drayton—on board. I invited these gentlemen to accompany me. We landed shortly after our arrival and took up our residence in Seyed Majid's house, which had been placed at my disposal. The *Orestes* then proceeded to sea to cruize about for the suppression of the slave trade, and Captain Gardner promised to call for me in a week.

I need hardly describe a place so well known as Mombassa; it has the usual Arab characteristics of ruin, neglect, and filth in a striking degree. The only object of interest is an extensive fort, built in 1596 by the Portuguese, and restored by them in 1635, as an inscription over the principal gateway, headed by the Christian monogram I. H. S., informs us. It is a work of considerable pretension, with upwards of a hundred guns in position, but in a ruinous condition, and the interior

is so crowded with inflammable buildings, that the explosion of a single shell within its walls would render it untenable.

On the morning of the 30th ultimo we started for Kisalidini in the Rabbai district, the station of the Rev. Mr. Rebmaun, of the Church Missionary Society. We proceeded up a remarkable *khore* or inlet, which has all the appearance of a winding river, bordered by impenetrable belts of mangrove trees. After sailing three hours we left our boats and proceeded by land a further distance of two hours through a hilly country, now parched and burnt up by four months of continuous dry weather, but which after rain must be exceedingly beautiful.

Mr. Rebmaun's station is situated on a hill about 800 feet above the sea, and commands a fine view of the plain below and of the undulating district to the West. I need hardly say that we were most hospitably entertained by that gentleman and his wife, the former of whom for eighteen years, and the latter for twelve years, have laboured to propagate the Gospel of Christ amongst the heathen of Wanika.

I have some hesitation in reporting on the result of the teaching of these devoted Missionaries. I confess it appeared to me disappointing; but they have had to contend against a series of difficulties under which many would have succumbed. The Mission station consists of several well built and commodious houses, but all in a state of *semi*-completion; six converts have been baptized, and about as many more are under tuition. Owing, however, to his being without a fellow-labourer, Mr. Rebmaun has been obliged to give up regular tuition for some time past, and is now devoting himself to completing the Mission buildings.

I cannot better describe the difficulties with which Mr. Rebmaun has had to contend, than by quoting his own words in a letter to my address:—

"When we last saw you at Aden, seven years ago, we were just passing through the darkest part of the East African Mission. It seemed as if we had come too early to this part of the world, and the people were unprepared either to understand or to appreciate our message. Nothing seemed comprehensible or creditable to them, but that we must have come to regain possession of the old castle at Mombassa which they knew had been built by the *Wasunga*; but soon after the crisis came. The late Imam died on the 19th October 1856,

and Colonel Hamerton in consequence no more considered it safe for us to remain, * * * and as if his voice had not been loud enough to call us away from a people who had no wants beyond their cattle and their toddy, a member of the Committee of our Society, the late Admiral Trotter, was to come just at the right moment, and he not only urged our immediate departure, but offered to take us at once to the Cape in his own ship. * * * We quitted the place, which after all had become very dear to us, on the 22nd of January 1857. Scarcely had we left, when the terrible hordes of the Massai overran the whole country down to the sea shore, killing whomsoever they found in their way, and carrying off in one day all the cattle of the Rabbai territory. Thus our poor deluded people, who to abject ignorance had added arrogance and cattle pride, were now deeply humbled, and herein I even then saw a star of hope for them, and I was not deceived. * * * We were however first to go to Zanzibar, where we would await further instructions from home. * * * After a stay of about half a year we intended to leave for Europe, and thus to human eyes, the East African Mission seemed to have come to an end. But there was soon to be a better resurrection. * * * I had taken with me the only Wanika who had attended on our regular instructions and had learnt to read. In September he went home to look after his family, and on Christmas-day he came back again, bringing with him a new convert, and the cheering statement that others only waited our return, when they too would become Christians. In the year following I paid another visit to the place, and the sight of a little band of converts, as well as the general joyous welcome I received, left no doubt in my mind that, instead of going back to Europe, we must first come back to a people who had now learnt to appreciate what before they had treated with contempt. In April 1859 * * * we returned again. The house at our station * * * was then still standing, but the rainy season, which had set in, kept us at Mombassa, where at the same time I had to repair our town house, which during our absence had been used by the Government for a garrison of Arab soldiers, who of course left it in a very deplorable condition. The rainy season was a very severe one, and caused another misfortune in the downfall of our house at Kisalidini. * * *

"One small portion, though dilapidated, was still standing, over which a temporary roof was made in the native style, but the repairs and

alterations to our house at Mombassa prevented us from returning to the place until the end of October 1859. * * * When therefore the *Baron Vonder Decken* arrived on the 24th of February 1861, we had not yet completed one year at the station, and when, towards the end of that year, we were visited by Colonel Pelly, we had been there only fifteen months. Though I had been hard at work during all that time in the reconstruction of a fallen house, still the whole compound, with a dilapidated remnant of the old house, some temporary miserable huts, the walls of a new house raised breast high, but scarcely visible because roofed over for the time with palm-leaves, presented an aspect which was yet anything but pleasing or inviting; and thus it came to pass *that an evil report went abroad about my station having been found in a state of decay and neglect.* The gentlemen who had seen the place could only think of the *many years* I had been in the country, *and explanations given in hasty conversation went for nothing.*

"But it may be objected much can be done in the way of building in fifteen months. This is true on the coast, but not half a day's journey inland. For a considerable time I could not build for want of water; so, to secure a proper supply, I had first to dig reservoirs; stones had to be quarried, and the lime had to be carried on men's heads a distance of about five miles from the landing place; all this required much more time. The charge of neglect thus falls to the ground; and as to decay there was none; it was simply a remnant of the fallen-down house. * * * In fact, when we came back from Zanzibar, after an absence of two years, it was little better than if we had but just arrived from England for the first time; and the many years I had been previously in the country were no more to be taken into account, except for the experience I had gained. Since then my principal time and strength have been spent in building-business, and alas, up to this day I cannot say it is finished." From Rabbai we proceeded to Ribe (distant ten or twelve miles), where a Mission was established two years ago by the United Free Methodist Churches. Dr. Krapff, to whom its formation had been entrusted, brought out two English and two German companions; the latter were found quite useless, and were sent home again; one of the Englishmen was compelled to leave from bad health, and for a year Mr. Wakefield remained alone at his post. He was joined a year ago by Mr. New, who came in the *Pleiad* from Bombay, and in February of this year Mr. Butterworth, a young man of the

highest promise, arrived from England. We found this gentleman suffering from a severe attack of fever, aggravated by his refusal to take quinine or any but homœopathic remedies. It was at once apparent to us that his recovery was hopeless, and he expired on the 2nd April, and was buried on the following morning close to the Mission station.

The members of this Mission have suffered greatly from fever; nevertheless their time has been well employed. A comfortable iron house has been erected, with sufficient accommodation of a temporary nature for their servants, and four or five acres of ground have been cleared of jungle and prepared for cultivation as soon as the rains shall commence. They have not indeed done much in the way of tuition—that could hardly be expected at first—but I have strong hopes that the fruit of their work will soon become apparent."

We returned to Mombassa on the night of the 3rd instant by a route very similar to that by which we reached Rabbai."

Mr. Rebmaun, whose long residence amongst the Wanika has made him thoroughly acquainted with their language and character, gave me much information regarding this interesting people.

They appear very fair specimens of the East African race; they want the fine features and bold and restless character of the Somalie, but they are equally without the air of stolid indifference and stupidity which marks the Sowahilie of the coast. Their countenances are bright and pleasant; they are good tempered, hospitable to strangers, and easily led in matters which do not militate against their tribal customs, by which they are governed as with a rod of iron.

Both sexes go naked from the waist upwards, and adorn their arms, necks, and legs with beads and coils of brass-wire to an extent which appears only limited by their finances. The males carry bows and poisoned arrows, a short club, and sometimes a rude sword resembling a spear-head. They shave half the head from the forehead upwards, and wear the hair on the remainder in long plaits or twists which are frequently strung with beads or the bright red seeds of the *Erythrinia Indica*.

The marriage bond is but a slight one, and continency is hardly known. Children are betrothed at an early age, and marriage takes place as soon after puberty as the father of the bridegroom is able to pay

the few dollars which constitute the dowry. This, however, is given to the bride's family, and she has no share therein. In case of divorce, which is frequent, this dowry is reclaimed, but it is not paid till the girl has found another husband. The children belong not to the parents but to the mother's eldest brother, who not unfrequently sell them into slavery in times of scarcity.

Famine is of frequent occurrence, as the Wanika are extremely improvident, and almost too indolent to cultivate the small quantity of cassaba and Indian corn necessary for their subsistence. Palm-wine is their great luxury, and so long as they can sit lazily in the shade sucking this through a reed, they ask for no higher enjoyment.

They recognise, though they hardly worship, a god. He is regarded as a being to be feared and propitiated; but the most potent agents are the *comas* or shades of their ancestors, who are appealed to on failure of rain or in cases of sickness, when offerings of palm-wine and corn are placed on their graves. They believe that the mists which gather on the mountain-tops are the fires of the *comas*, who constantly hover round their former habitations. This clearly proves that they understand the immortality of the soul, though they have no idea of a future state of rewards and punishments.

The right of circumcision is universally practised, and each important event in their lives, such as the planting of seed or reaping the harvest, is marked by its distinctive ceremony. No Wanika may engage in any handicraft, and they are entirely dependent on Mombassa for the simplest implements of husbandry, pottery, cutlery, &c.

The males are divided into three orders:—

1*st.*—*M'fia,* or elders.

2*nd.*—*Kambi,* or intermediate order; and

3*rd.*—*N'yairi,* or youth.

Admission is obtained into the superior grades by constant payments or offerings of palm-wine and the performance of certain ceremonies.

Those appointed for the admission of youth into the superior order *Kambi* only occur about once in a generation, namely when all the previously appointed *Kambi* have been absorbed into the rank of elder; thus, one frquently observes middle-aged men classed as youth.

On a fixed day the youth are all assembled in a certain place, whence the clay with which the bodies are to be smeared is to be taken, a

fire is lighted, and a sacrifice offered. At a given signal the youth rush to the fire and extinguish it with their naked feet, and each seizes a lump of clay. All this time they are beaten by the men of the *Kambi* or 2nd order with the palms of their hands. They then cover their bodies with clay, and in this state, entirely divested of clothing, they are required to pass eight days in the forest. They then apply a second coating of clay, taken from any place they please, and pass another week in the same manner as the first. During all this time decency is laid aside and the utmost license prevails. At the close of the second week they return to their homes and resume their usual avocations; but they still continue the application of clay till the order is given for the concluding and most horrible part of the ceremony.

This consists in some one of the candidates killing a man; he must not belong to their tribe, but must be a person of some consideration in another one; the murder of a poor slave will by no means be accepted. The particulars are kept a profound secret; the novices simply inform the elders that the victim has been slain, whereupon the former wash their bodies, shave their heads, and the ceremony of initiation is completed.

Promotion from the second to the highest order is performed gradually as the aspirants are able to pay the prescribed offering. These consist of an unlimited quantity of palm-wine given to the elders during a series of years, and finally two goats, thirty measures of rice, and twenty-four fowls. While these are being presented, the *muanza* or sacred horn, at other times carefully concealed in the forest, is played in such a manner as to make the sound emitted resemble the word *m-bo-see* (a goat). The rice is then put into three large pots kept for the express purpose, and to each pot eight fowls are added. This mess, with the goats, is eaten by the elders.

The *Kambi* or middle order is divided into four classes; the first consists of the eight eldest men, who are called "people of the hair," and have the privilege of selecting the prime pieces when an animal is killed. The second and third sections also consist of eight men each, next in age, while the fourth includes all the remainder.

On the day fixed for the initiation of the *Kambi* into the rank of elders, they assemble in the village, while the elders meet in one of their sacred places, disposed in two ranks so as to form a street; each man is armed with a switch, and the candidates are brought two at a time and

made to pass along the street, and receive a cut with the cane from each elder as they pass him. The sacred horn is then exhibited, and this terminates the ceremony, which is repeated from time to time till the whole of the *Kambi* have become elders.

The whole power lies in the hand of the elders, and though each tribe of the Wanika has an hereditary chief, his authority is merely nominal.

The *Mugauga* or soothsayer plays an important part amongst the Wanika. He is consulted when one is suspected of having bewitched another. The relatives of the person afflicted, together with a near relative of the suspected culprit, and two men of the tribe as impartial witnesses, meet the *Mugauga*, who must belong to a different tribe, and be unacquainted with the circumstances of the case.

This however is a mere farce, as the inquirers have already fixed on an obnoxious individual, and they only want some kind of sanction in order to justify their intended murder to themselves and others.

The soothsayer places himself before a wooden bowl made for the purpose with legs; water is thrown into it and castor-oil beans are thrown into the water while the operator holds in his hand the tail of a giraffe. With this he strikes the water, causing the beans to revolve in it, and fixing his eyes on them, as if reading a book, gives a description of the desired person. He then makes the listeners retire, and consider whether the description he has given tallies with that of the person whom they suspect, and as there is never any difficulty on this point, the soothsayer, after a little more incantation, walks up to the son or near relative of the intended victim, and strikes him with the tail.

The party then retires, keeping profound silence regarding the victim; a feast is shortly afterwards given, and when the victim has been made drunk with palm-wine, he is seized and strangled.

Sometimes one who is supposed to be a sorcerer of the worst kind is burned alive, the grave being dug before his eyes, and taunts of every kind being addressed to him while the work is being carried on.

The punishment of death is rarely inflicted for other offences, but fines are levied on every conceivable pretext; in fact the ultimate object of all their ceremonies and laws appears to be to induce the lower orders to give as much as possible to the elders.

The *Orestes* returned to Mombassa on the afternoon of Tuesday the 5th ultimo, and on the following morning she put to sea. We spent one day (the 8th) at Pemba and returned to Zanzibar this day.

ART. XVIII.—*Extract from the Administration Report of the Political Agent at Zanzibar for the two past years ending with the 31st May 1864.— Contributed by Government.*

[Read before the Society, September 15th, 1864.]

THE Administration Report of an independent country like Zanzibar, where the Political Agent exercises no control or jurisdiction, except over British subjects and protégés, must necessarily be little more than a narrative of the chief political events which occurred during the year, and a review of the state of trade.

I will commence with the latter; but first I would remark that, as no regular books or accounts are kept at the Custom House, save of such articles as pay import duty, it is no easy matter to obtain reliable information. I believe, however, that the statements contained in this report are a very close approximation to the truth. Every one has done his utmost to facilitate my inquiries: the books of the Custom House have been placed at my disposal, the various Consuls have given me copies of their official returns, and individual merchants have favoured me with statements of their transactions.

Nevertheless, these returns exhibit only the exterior trade of the town and island of Zanzibar, and by no means represent the entire commerce of the Sultan's dominions. A lucrative trade is carried on by the Northern ports, such as Lamoo, Mombassa, Magdashooa, Meska, and Branva, with the Red Sea, Persian Gulf, and India; European vessels frequently ship their cargoes thence, and produce is exported from every part of the coast unknown to, and uncared for, by the authorities, as no export duties are levied.

Era adopted in Trade Returns.

I have been obliged to follow the maritime era of *Kudmee* of *Nowroz*, according to which the books of the Custom House are made up; the years under review are therefore from the 1st of August 1861 to the 31st July 1862, and between the corresponding dates in 1862-63.

To disencumber the text as much as possible, I have attached, in Appendices A and B, detailed statement of the export and import trade between Zanzibar and the various countries of the East and West which have commercial relations with it; the amounts are calculated in Austrian dollars, the standard of the place, and the following is a summary in pounds sterling:—

Summary of Trade.

1861-62.... Imports £ 361,834
Exports „ 428,016

Total..... £ 789,850

1862-63.... Imports £ 538,486
Exports „ 467,794

Total..... £ 1,006,280

Increase during the latter year.... £ 216,430

Distribution of Trade.

The distribution of the above trade was as follows:—

Imports.

From what place.	1861-62	1862-63	Increase	Decrease
	£	£	£	£
United Kingdom	..	24,908	24,908	..
British India	117,790	157,660	39,870	..
Protected States of India	19,789	18,336	..	1,453
Arabia and Persian Gulf	10,063	10,572	509	..
Coast of Africa and adjacent islands	115,856	206,394	90,538	..
France	29,305	34,500	5,195	..
Italy	..	7,263	7,263	..
United States of America	27,789	26,179	..	1,610
Hamburgh	41,242	52,674	11,432	..
Total....	361,834	538,486	179,715	..

Exports.

To what place.	1861-62	1862-63	Increase.	Decrease.
	£	£	£	£
United Kingdom	..	..	..	..
British India	119,632	100,586	..	19,046
Protected States of India	48,189	44,708	..	3,481
Arabia and Persian Gulf	12,642	23,936	11,294	..
Coast of Africa and adjacent islands	159,223	169,205	9,982	..
France	40,219	39,176	..	1043
Italy	..	3,136	3,136	..
United States of America	11,343	39,176	27,833	..
Hamburgh	36,768	47,871	11,103	..
Total	428,016	467,794	63,348	..

British Trade.

From the preceding it will be seen that British trade, as represented by the first two items in each table (and indeed, the third might almost be added), is considerably greater than that of any other foreign country; the only item more considerable is the trade with Africa, which, being chiefly between places in the Sultan's own domimions, cannot be regarded as *foreign* trade.

Take for instance the year 1862-63, and deduct the *home* or African trade, and we find the value of British trade at Zanzibar is nearly two-thirds of the aggregate of that of all other nations. But it is even more considerable than this would indicate; nearly every native merchant, shopkeeper, and artisan is a British subject or protégé. These supply the European merchants and almost monopolize the African trade, so that it is no over statement to allege that four-fifths of the entire commerce of Zanzibar passes through the hands of British subjects.

Direct Trade with great Britain.

It is only during 1862-63 that a direct trade with great Britain has sprung up; one of the principal Bombay firms has established a branch here, but

the experiment is too recent to admit of an opinion being formed regarding the success of the undertaking.

Principal Imports and Exports.

The following table exhibits the principal articles of import and export:—

Imports.	Value. 1861-62.	Value. 1862-63.
	£	£
Beads	35,000	81,659
Cowries	36,000	50,000
Grains and Cereals	95,800	48,000
Gum Copal	1,50,000	2,00,000
Ivory	30,320	2,77,161
Oil and Oil Seeds	15,000	1,08,937
Orchella	60,000	65,000
Piece Goods, Cotton	5,83,100	8,39,716
Slaves	1,20,000	1,00,000
Treasure	3,21,500	3,77,500

Exports.	Value. 1861-62.	Value. 1862-63.
	£	£
Cloves	2,01,840	2,32,087
Cocoanut	1,02,117	1,43,126
Copal	1,03,962	1,60,277
Cowries	1,16,910	41,400
Hides	49,889	93,302
Ivory	3,09,777	2,53,132
Oil and Oil Seeds	84,649	1,58,116
Orchella	7,722	74,840
Piece Goods, Cotton	4,68,000	5,12,053
Treasure	3,85,000	2,43,000

Beads.

Nearly all the beads for the Indian, China, and African markets are manufactured at Venice, and of these about one-twelfth part find their way

to Zanzibar *viâ* Hamburgh and India; they are taken to the interior of Africa, and form one of the principal articles of barter for slaves and ivory.

Cowries.

Cowries are collected on the mainland, brought here in native boats, and exported to the West coast of Africa by Hamburgh merchants, and to India by Indian traders. Formerly large sums of money were made in this branch of trade, but owing to the more extended use of the precious metals as currency, it has very much fallen off, and the decline is so steady, that it promises ere long to become extinct.

Copal.

The well-known fossil gum copal is found by digging a foot or two below the surface of the ground, in localities where the forests which produced it have long since disappeared. The island of Zanzibar, where not a tree is known to exist, produces a small quantity, but the most productive fields are on the mainland. The recent gum is also found further to the north, but it is softer and much less valuable than the fossil resin.

Ivory.

It is only in copal and ivory that any monopoly exists in the Zanzibar dominions; in every thing else the market is open to all, and the only customs duty charged, is one of five per cent. on imports. Ivory is variously charged, according to the districts whence it comes; the rule which guides the authorities in fixing the duty, is simply the question how much it will bear, without driving trade into other channels. Thus—

Ivory from Uniamezi pays.....	£	14	per 36 lbs.
,, Keelwa.....	,,	8	,,
,, Panguni and Tunga.....	,,	8	,,
,, Mombassa and Lamboo	,,	4	,,
,, The Somali country	,,	2	,,

I entertain hopes that this false system will speedily be altered, but at present the state of the finances of Zanzibar prevents any sudden change which would result in a loss of revenue.

It is a very few years since Sesamum seed was grown on the East

Oil seeds.

coast of Africa. The trade in it is increasing, but it is still capable of much extension. It is principally exported to France and Hamburgh, and is used for making the "Olive oil" of commerce.

Orchella.

Orchella is obtained from the more arid parts of the coast to the north; none grows on the island.

Piece goods.

At one time the market was largely supplied with Piece Goods of American manufacture, but since the war, English cloth has taken its place, and American merchants have even imported Manchester goods from America.

Slaves.

Hereafter I shall enter at greater length on the question of the slave trade; I will only state, in passing, that the imports show a steady decrease year by year.

The number in	1860-61	was 19,000
,,	1861-62	,, 14,000
,,	1862-63	,, 12,000

Cloves.

Cloves are grown in Zanzibar and Pemba only; they were introduced about 34 years ago from Mauritius, and now they cover both islands. At Mauritius they have long since disappeared, and it is to be hoped that here too they may be soon superseded by sugar. They are gathered with little labour, and the trees receive no attention after they are planted, but the crop is most uncertain. The average quantity produced is about seven million pounds, valued at £85,000; but sometimes, as during the present season, it is almost a total failure.

Shipping.

The trade with India and Africa is almost entirely carried on by native boats of various descriptions. I have no means of obtaining even a proximate estimate of their number and tonnage, but the following is a statement of the square-rigged vessels which arrived during the two past years:—

	1861-62.		1862-63.	
	No.	Tonnage.	No.	Tonnage.
British ..... Men of war	14	12,947	24	17,226
British ..... Merchant ships..	8	3.508	12	5,996
American..... Merchant ships..	10	3,453	14	4,665
French ..... Men of war	3	2,850	1	150
French ..... Merchant ships..	10	4,036	10	5,583
Hamburgh ..... Merchant ships..	12	2,827	8	2,480
Arab..... Men of war	4	1,564	6	3,838
Arab..... Merchant ships..	10	3,548	11	2,078
Hanoverian..... Merchant ships..	2	380	..	..
Portuguese .... Men of war	2	680	..	..
Portuguese .... Merchant ships..	3	228	1	79
Sardinian..... Merchant ships...	..	..	1	400
Total....	78	36,021	88	42,495

Revenue.

The entire Customs revenues of Zanzibar are farmed to an Indian firm, which, for the annual sum of £ 190,000, obtains the privilege of collecting all Customs dues in the Sultan's territories. The following is a proximate statement of the revenue derived by His Highness from all sources :—

Customs dues.....	£	190,000
From Pemba, in addition.....	,,	6,000
Tribute from the Mukhadim	,,	10,000
His Mighness' Clove plantations.....	,,	15,000
Total....	£	221,000
Deduct subsidy paid to the Muscat state under the Viceroy of India's arbitration	£	40,000
Balance....	£	181,000

This income is barely sufficient to discharge his most pressing necessities, and there is no margin available for works of public utility or internal improvement. His Highness is debarred by treaty from imposing any export duties, harbour dues, or even from increasing the import duties; he has therefore, at my suggestion, had recourse to a modified system of land tax, which became law on the 14th of September 1863.

New Taxes.

The owners of land are thereby required to pay 2 pice (3 farthings) *per annum* on every mature cocoanut tree, the estimated annual produce of which is a dollar or 128 pice; and an octroi duty of five *per cent.* is to be charged on all cloves brought to market.

It is calculated that this will produce about £ 40,000 *per annum*, and it will hardly be felt by His Highness' subjects, who have hitherto been exempt from direct taxation in any form.

In anticipation of the proceeds of these taxes, His Highness has already ordered three iron bridges from England, and he is building a handsome new Custom House, half the cost of which, however, will be borne by the farmer of customs.

From the preceding remarks it will be seen that the Zanzibar State is of considerable commercial importance, especially to great Britain; there appears, however, to be an idea that the trade with this coast is capable of almost unlimited extension, but this is an opinion which I do not share. The countries on the mainland which supply the Zanzibar market are in such a backward and disorganized state, that any considerable expansion of the existing trade cannot be expected for a very long time to come; but the resources of the island itself are almost unlimited, and by a judicious application of European capital and energy, it might be made one of the richest sugar-producing countries in the world.

I am glad to know that this idea is obtaining acceptance. Already the firm above alluded to has made extensive preparations for embarking in the cultivation of sugar, and several French planters from Bourbon have visited this island with a view to inquire into its capabilities; one has even purchased an estate, and purposes shortly coming here with his family, as owing to disease, and the baren insect, the sugar-cane crop in Réunion is yearly becoming worse and worse.

Every condition requisite for the successful cultivation of sugar exists here in great perfection; labour is cheap and abundant, the soil

is fertile, almost beyond any I have seen; and the climate, which has been most unjustly maligned, is pleasant and by no means unhealthy.

Before my arrival here I had heard the most discouraging account of the climate of Zanzibar. I was told that at certain seasons the heat was oppressive, and that it was death for an European to sleep even a single night in the country; but I determined to judge for myself, and after a year's experience no doubt remains in my mind that, with ordinary precautions, the climate of Zanzibar is as healthy as that of other tropical climates; it is never cold and never unpleasantly hot, as the attached climate calendar (marked C) will show.

I have a country residence where I pass much of my time generally in company with several friends. Two European gentlemen lately made a lengthened tour through the interior of the island, and neither they nor I, nor any friend who has visited me at my country house, have suffered any evil effects.

I may be told that this statement is opposed to actual facts, that several Europeans have been engaged by the Sultan to superintend his sugar factory, and with most disastrous results, and that a party of English sailors, which made an expedition into the interior during the late rebellion, suffered greatly from fever and lost several of their number. I am well aware that accidents like these have occurred, but they are all capable of explanation. The Sultan's sugar estate is situated in an extensive swamp, the sailors encamped in the open air without any shelter from the sun by day or from the damp by night; but I feel convinced that if ordinary prudence is exercised in the selection of a site for a residence, on dry well raised ground, or, better still, on the sea coast, the country will be found even more healthy than the town.

Coinage.

The standard currency of Zanzibar is the German crown or Austrian dollar, but that coin is becoming scarce, and the following have been declared legal tender at the rates specified against each:—

	German Crown
The gold ounce	15
,, pound sterling	4·75
,, 20 franc piece	3·75
,, 10 do.	1½

	German Crown.
The gold 5 france piece	$\frac{15}{16}$
Silver 5 franc piece	0·94
Indian Rupee	0·47
American Dollar	as German Crown.

These values are constant and unaffected by the fluctuations of the money market. Smaller sums are paid in Indian pice or 3 pie pieces, which vary in value from 108 to 130 per German Crown; the present value is 128.

Price of articles in the Market.

The following is the average price of live stock in the market of Zanzibar :—

Bullocks	each	ℳ	6	to	12
Sheep	,,	,,	3	to	5
Goats	,,	,,	$2\frac{1}{2}$	to	5
Horses			Nominal.		
Arabian Donkeys	each	ℳ	20	to	100
Fowls	dozen	,,	$\frac{7}{8}$	to	1
Chickens	,,	,,	$\frac{5}{8}$	to	$\frac{3}{4}$
Slaves, adult, male or female	each	,,	10	to	30
Ditto boy or girl	,,	,,	5	to	10
Ditto girl, as concubine	,,	,,	10	to	150
Hides	,,	,,	$\frac{7}{8}$	to	1

Quantities sold in retail for one Austrian dollar :—

Beef	12	lbs.	
Cocoanuts, fresh	100	No.	
Ditto dried	40	lbs.	
Cocoanut oil	14	,,	
Chillies (Red Pepper)	23	,,	
Coffee, Mocha	6	,,	
Cloves	23	,,	
Copal, gum	6	,,	
Cassava Root	120	,,	
Eggs	100	No.	
Firewood	350	pieces	
Fish, fresh	30	lbs.	
,, salt	10	,,	
Flour, American	20	,,	
Ghee	9	,,	
Jowarrie	100	,,	
Mutton	9	,,	
Milk	15	Bottles.	
Mangoes	500	No.	
Oranges	1,000	,,	
Pine-apples	200	,,	
Sesamum Seed	45	lbs.	
Rice, 1st sort	38	,,	
Ditto 2nd sort	45	lbs.	
Wheat	50	,,	
Wheaten Bread	12	,,	
Sugar, loaf	6	,,	
Ditto soft	10	,,	
Tobacco, native	8	,,	
Sweet Potatoes	100	,,	
Yams	140	,,	
Salt	300	,,	
Wax, bees'	$4\frac{1}{2}$	,,	

Political events.

During the past year His Highness Seyed Majid undertook an expedition against his rebellious subjects at Sewee, and was entirely successful in reducing them to subjection.

Sewee is not a place of much commercial importance, but it appears to be the pulse of the whole district in which Lamoo and Mombassa are situated; according as it exhibits symptoms of loyalty or the reverse, so one may be pretty well assured that the whole district is well or ill affected to His Highness.

Even in the lifetime of Seyed Saeed, that able and energetic Prince was never able to keep it in subjection, and he found it expedient to adopt a temporizing policy, which had the effect of smoothing difficulties for the time only, to make them more unmanageable afterwards. And in truth it was not an easy matter to keep this turbulent people in order; their city is surrounded on three sides by swamps, and on the fourth by an arm of the sea, entirely dry at low-water; while, owing to a peculiar custom which prevails there, it is never without a large garrison. The head man has a body of self-liberated slaves about him, who are designated and style themselves Haramees or ruffians, and any slave who wishes to escape servitude may join this band and his master cannot claim him. They receive no pay or rations, and subsist entirely on pillage.

About 18 months ago these men expelled Seyed Majid's garrison, and threw off their allegiance to his government. At first His Highness despatched Seyed Suleyman, the Governor of Zanzibar, to reduce them to order; but seeing that very little good was effected, he wisely determined to proceed thither in person with all his available troops and three vessels of his squadron. He landed a party of troops on a sand-bank facing the town, mounted two or three heavy guns on it, and speedily reduced the place to order. About 150 of the defenders were killed, but no casualties took place on his side.

He has now built a fort in such a position as to dominate the town, armed it with four guns, and has left a party of soldiers and an officer to garrison it. The expense of this expedition amounted to £ 60,000.

ART. XIX.—*Notes on the Earthquake of the 29th April 1864 in the North-western part of the Bombay Presidency.*—By D. J. KENNELLY, Esq., Corresponding F.R.A.S., F.R.G.S., Honorary Secretary to the Bombay Geographical Society.

[Read by the Author before the Society, October 20th, 1864.]

THE infant state of the science of Seismology, derived from the observation of the facts of Earthquakes, will be deemed by the Society a sufficient apology for placing before them, in connection with the remarks I have to offer on the Earthquake of April last, a few prefatory observations on the science itself, which, during the last twelve years, has been greatly matured, chiefly by the philosophical investigations of Mr. R. Mallet, Mr. David Milne, and of M. Perrey, of Dijou.

The Reports of the British Association for the Advancement of Science for the years 1850, 1851, 1854, and 1858, and Vol. XXII. Transactions of the R. I. Academy, contain papers from Mr. R. Mallet and from his son Dr. J. W. Mallet, incorporating almost every thing that is known relative to earthquakes, including the results of the series of very able papers on British Earthquakes in the Edinburgh Philosophical Journal, Vols. XXXI.—XXXVI. from Mr. David Milne, as well as those obtained from Lieutenant Baird Smith's extensive contribution of 162 Indian Earthquakes, contained in the XXII. Volume of the Journal of the Asiatic Society of Bengal.

Mr. Mallet, in his able report on Earthquakes, contained in the Report of the British Association for the Advancement of Science, 1858, states, "The whole base of induction for such conclusions as are here arrived at, embracing between 6,000 and 7,000 separate recorded earthquakes over every known part of the globe, both on land and ocean, the character of the facts given, their scantiness as to information of scientific value, the methods, or rather the want of all method in their observation, and other causes mentioned in the second report, I think justify me in stating my conviction, that nearly all that can be drawn from the collection and discussion of such records has now

been done, and that the labour of collecting and calculating further and future Seismologues will be in a great degree thrown away, unless the cultivators of science of all countries, in conjunction with the scientific bodies and the scientific departments of the chief civilized Governments of the world, shall unite in agreeing to some one uniform system of Seismic observation, and record and transmit the results periodically to a central bureau for discussion. What has been done for Astronomy and for Terrestrial Magnetism is beginning to be done for Meteorology, and through the suggestive labours of Maury, Bache, and others for maritime discovery, ought to be done now for Seismology, whose chief requirements could be readily added to those already supposed to be systimatized from Maury's proposals, as well as to those long in course in the Astronomical, Magnetic, and Meteorological observations of the world."

The spread of the net of Telegraphic wires rapidly over the whole earth offers facilities for the observation of earthquake phenomena, in which time always enters a so important an element never before possessed. It is to be regretted that Mr. Mallet's appeal has not met with all the success it has deserved. Observations continue to be made, but not with that systematic exactitude, nor with the knowledge of the elements necessary, as to place at the disposal of the Physicist all that otherwise might be produced from such labours.

This becomes manifest from the various attempts by observers in general and by correspondents of newspapers in particular, in describing their observations, the main feature of such being, generally, their utter want of uniformity in details, and ignorance of what it is desirable should be observed respecting such phenomena. An instance lately occurred where a writer, in contributing his observations to the London *Times* stated, that "he felt something which he thought must have been an earthquake, and that he got up and immediately lighted a candle." Mr. Mallet, in an article lately written by him in the Quarterly Journal of Science on the subject of Earthquakes, comments humourously on this, by saying, the writer might have added, that in this case he did not put it under a bushel! and goes on to say—"The pseudo-scientific communications chiefly record the exact state of barometer and thermometer at the moment of shock, facts now known to be nearly as irrelevant as the price of consols the day before—so much for the observers of the west."

Here in the East, among the old nations, observations made by the inhabitants when noticed usually proclaim that on such an occasion Bruhma turned sides, or that the world-bearing Tortoise had stirred his flippers, or, as related by a correspondent in Kattyawar relative to the earthquake forming the subject of this paper, that the iniquity of the people had become so great and intolerable, that as a warning mother earth had signified her displeasure by an ominous quake.

In a late number of a London Scientific Journal, already referred to, the question has been asked, "What is an Earthquake? There are some who have read, many who have talked of them, and some even who have felt their effects. But what are these effects? and the cause—what is it? Let us mention one or two things which an Earthquake is *not*. It is never one of the means by which permanent geologic elevations of the land are produced, though too often confounded with these in all sorts of geological systems and ex cathedra utterances. Nor is it the reaction of the interior of a planet upon its exterior, for that, oracular as it sounded from the lips of a Humboldt, is in fact to say nothing." What, then, is an earthquake? Mr. Mallet here gives us the definition of science of to-day as the result of his searching analysis of the subject, contained in the Report of the British Association for 1858.

"An earthquake," he says, "is the transit of a wave or waves of elastic compression in any direction from vertically upwards to horizontally in any azimuth, through the substance and surface of the earth, from any centre of impulse, or from more than one; and which may be attended with sound and tidal waves, dependant upon the impulse and circumstances of position as to sea and land." This is what science defines an earthquake to be, but which, to receive with intelligence, had better be investigated before we proceed further, and here we may in a concise manner do this in the words of the Seismologist already mentioned:—

"The earthquake shock is produced by a wave of elastic compression passing through some portion of the substance of our earth. Elasticity is that property in the matter which tends to the restoration of figures in solids, and of volume in liquids and gases when altered by an extraneous force, and is a term often confounded with another—flexibility. Thus, when people praise the springs of an easy going

carriage, by saying "they are so elastic," they mean they are so flexible. Elasticity and flexibility are, in fact, opposites in some respects. A perfectly elastic solid is one that, after forcible alteration of figure completely restores itself; if perfectly flexible, it would not restore itself at all, and might be beat to any extent without. No such bodies exist in nature. All terrestrial materials present variable combinations of elasticity and flexibility, neither being perfect."

As the earthquake we are about to consider made its influence to be felt over a large superficial area, it may be well to illustrate what would be the probable chief features of the seismic influences in their operation over the whole surface. But before attempting to do this, it will be well to glance back at the history of the great earthquake of Cutch, the first shock of which, and the most violent, took place at a few minutes before 7 P. M. on the 16th June 1819, continuing with shocks of inferior violence until the 20th, when the volcano called Denodar, situated 30 miles North-west from Bhooj, burst into action, and the movements of the earth at once ceased.

Captain Baird Smith in describing this earthquake says, "We have no accounts of the effect of this earthquake at any point further Westward than in the Province of Cutch, although from its violence it is probable that it extended to Sind and Mekran."

The effects of the shock in the Western portion of the province were remarkable and severe.

An extensive subsidence of the delta of the Indus took place, and says Mr. Lyell, "although the ruin of towns was great, the face of nature in the inland country was not visibly altered."

"In the hills some large masses only of rock and soil were detached from the precipices, but the eastern and almost deserted channel of the Indus, which bounds the Province of Cutch, was greatly changed."

"The estuary or inlet of the sea was before the earthquake fordable at Lucput at high tide, then never being more than 6 feet, but this was deepened after the shock to 24 feet. By these and other remarkable changes of level a part of the inland navigation of that country, which had been closed for centuries, became again practicable."

Another remarkable alteration effected by this memorable convulsion was the upheaval of a mound of sand near Sindree, extending

East and West for a considerable distance, passing immediately across the channel of the Indus, and separating the Phurraeen River from the sea.

The natives called this mound by the name of "Ullah Bund," or the Mound of God, in allusion to its not being like the other dams of the Indus, a work of man, but a dam thrown up by nature. The natives assigned to it a length of 50 miles.

Thus, at the western extremity of Cutch, the effect of the earthquake of 1819 was to produce simultaneously an elevation of a tract of country 50 miles in length, 16 miles in breadth, and 10 feet in height, and a depression of another tract, extending over about 2,000 square miles, which latter became an inland lake or lagoon.

"At Bhooj the shock was exceedingly heavy, lasting from two to three minutes, in which short period the city was almost levelled to the ground." Professor Jameson states, "It was calculated that nearly 2,000 persons perished at Bhooj alone."

"In the British camp, which was pitched in a plain between the fort and city of Bhooj, the general feeling was an unpleasant giddiness of the head and sickness of stomach from the heaving of the ground; and during the time the shock lasted, some sat down instinctively and others threw themselves on the ground. Those who were on horse back were obliged to dismount; the earth shook so violently, that the horses could with difficulty keep their feet, and the riders when on the ground were scarcely able to stand."

In the city of Ahmedabad, the same writer states, "The devastation caused by this commotion of the earth is truly lamentable. The proud spires of the great mosque, erected by Sultan Ahmed, which have stood for nearly 450 years, have tumbled to the ground within a few yards of the spot where they once reared their heads. The fort and town of Jelelsheer are reduced to ruins. Many of the people killed were already out of doors, which is usually considered a situation of comparative safety. A marriage was about to be celebrated in a rich man's family, and the castes had assembled from various quarters; the shock occurred when they were feasting in the streets, and upwards of 500 of the party were killed among the ruins of the falling houses."

"At Surat and at Broach the shock was less violent, but sufficient

to cause buildings to oscillate, the period of convulsion being at the last place about three minutes." Captain Baird Smith, summing up the data of this earthquake says, "The extreme limit of the earthquake of 1819 appears to have been Poona, where its force was only being feebly experienced. The tract affected therefore extends, so far as existing information shows, from about the meridian of 69° to that of 74° E. Long. and from 18° to 24° N. Lat." These limits are, however, by no means well ascertained, especially to the Westward of Cutch, and also to the Northward. The limits of the earthquake of the 29th April last, defined under such data as I have obtained, would appear to show the area of convulsion to be between the same meridians of longitude as that of 1819, but differing in parallels of latitude, that of April having extended to Mount Aboo, or about 40 miles further North, but again not reaching so far South by about 120 miles.

The difference therefore in the two earthquakes amounts to the following:—First, that while equal in the area of convulsion and situated between the same meridians East and West, the earthquake of 1819, starting from 18° North, extended northwards 360 miles, while that of April last, starting from 20° North, extended northwards 280 miles. Thus, while the data of the earthquake of 1819 gave an approximate area of convulsion of 99,000 square miles, that received for the earthquake of 1864 gives an area of 77,000 square miles, or 22,000 square miles less of convulsed area than the calamitous one which happened 45 years ago.

There is also another great difference—thus, while the area of the earthquake of this year is great, by the providence of God the evil effects have been relatively very small, for excepting the loss of 20 lives at Limree, by the falling of dilapidated buildings, no tidings of injurious consequences have been received.

The particulars of the earthquake of this year have come from the following positions:— Mount Aboo, the extreme North point, to Beleemora, the point farthest South, intermediately between which we have Ahmedabad, Kaira, and Surat, and to the West Dholka, Dholera, Limree, Wudwan, Dhundooka, and Wagur. The times of shock and the period of continuance I regret to say are so varied as to be almost useless for the purpose of calculation. The following is an extract from a letter from Ahmedabad, addressed to the Honorable the

President, who, without loss of time, was good enough to place it at the disposal of the Society :—

" *Ahmedabad*, 30*th April* 1864.

" We felt a smart shock of an earthquake here yesterday morning at about 11-15 A. M. It lasted for about twenty seconds, as near as I could judge. The oscillations seemed to be caused by the earth-wave rolling from south to north.

" The noise preceding and accompanying the shock was like that made by a heavy carriage running on a hard road.

" It was felt, I understand, very generally through the city, but I have not heard of any damage having been done. The weather has been very hot for some days. I did not consult the thermometer at the time of the shock, but I should say that it must have stood at about 96° or 98°. For the last few evenings the sky at the horizon has presented an unusually dark appearance just before sunset, looking much as it does after a dust-storm, though none have passed over, as the sky has been obscured by clouds towards morning for some nights.

" These clouds are carried over by a very strong Westerly current in the upper regions of the air, for though they travel with great rapidity, there is little or no breeze to be felt on the earth's surface. The mornings are cool and the air feels damp."

" *Ahmedabad, 2nd May.*

" Friday last we had a smart shock of earthquake, which lasted, to the best of my opinion, about a minute and a half; but, thanks to the Disposer of all events, it passed off without doing any damage. At about 11 o'clock A. M., as I was engaged in reading, I experienced a curious sensation (which words of mine are quite inadequate to describe) ; the room in which I was sitting rocked to and fro, and a rumbling noise, resembling far distant thunder, was distinctly audible. At first I was under the impression that the house was about to tumble about my ears ; the next moment found me in the open air with feelings better understood than described. The entire station was thrown into a state of the greatest alarm ; and even since the event it forms the general topic of conversation among all the classes."

"*Guzerat, Surat, 29th April.*

"A shock of an earthquake was felt here at half past eleven to-day. Direction of movement from North to South. Houses shook violently. Continued two minutes."

"*Tikhal, Surat Districts, 29th April.*

"A very sensible and smart shock of an earthquake occurred here at 11-13 to-day. It was distinctly felt both in the bungalow and in a tent in the neighbourhood. The oscillation appeared to be from West to East."

"*Surat, 29th April.*

"At about 11 o'clock this morning I was in the verandah of my house, and felt so decided a shaking several times for the space of about a minute, that I experienced the sensation of sea sickness, and moved from the vicinity of the house, thinking that it was an earthquake. A lady of my family, sitting in the house, felt her chair shaken some three or four times successively, and thought that the old tenement must be more crazy than was supposed if it could be thus shaken by the wind which was then blowing. I have since heard that a similar sensation was experienced by many persons in the neighbourhood at the same time. This may be interesting to some of your readers accustomed to watch meteorological events."

"*Surat, 30th April.*

"You will be surprised to hear that we experienced a sharp shock of earthquake here yesterday. It was perceived by several at the same time, about 11 A.M., and lasted two minutes, as nearly as possible; glasses rattling, doors shaking, walls vibrating; and to those who never before experienced anything of the kind, it was far from agreeable. It would appear to have travelled from East to West, but beyond the alarm it produced no other ill effect."

"*Kaira, 30th April.*

"Yesterday, at about five minutes before 11 o'clock, Kaira was visited with rather a severe shock of an earthquake, which lasted about a minute, and was distinctly felt both in the town and camp. The move seemed to come apparently from the South-west, and was preceded by a tremulous motion, which was followed by an undulatory movement of the earth, producing very much the feeling of sea-sickness, and rocking the house perceptibly. At one of the gates of

the town the motion was sufficient to detach a small portion of the masonry, which fell on the road close to some passers by. The people were much alarmed, and ran out of their houses, carrying their children with them, and crying out. The wind at the time the shock occurred was SSW., and the thermometer at 92°. I am unable to give the state of the barometer, not having had one at hand. This, I understand, is the second shock that has been felt in Kaira during the last four years; the one four years ago having been more severe and of longer duration. No damage to life or property has occurred. The weather has been very hot for the last month, the maximum heat in the shade being 103° Fahrenheit. We are all looking forward anxiously for the signs of the approaching rains, which the natives predict will be early this year. There is a great dearth of forage for cattle, and consequently a good deal of mortality among them, resulting from want of proper food more than anything else. In many parts of the country they have sown jowaree, which they are growing by irrigation to supply the want.

Earthquake.—We learn by private advices from Dhollera that the shock of an earthquake was experienced there at about 10-45 A.M. on the 29th ultimo. The shock appeared to travel from the North-west and lasted for about half a minute in the form of a regular tremble, and was accompanied by a noise as of distant thunder. Fortunately no mischief was done, but at Limree, some 36 miles distant from Dhollera, about 20 lives were lost by the falling in of dilapidated buildings. The wave appears to have overspread the whole of Jahalawar and a portion of the Guzerat districts, as accounts have been subsequently received of the shock having been felt at Wadhwan, Dhandooka, Dhollera, Ahmedabad, and as far down as Beeleemora." —*Surat Mitra.*

Kattiawar, 6th May 1864.

"One of those generally calamitous visitations upon which the human family has been taught to look with fear and trembling, an earthquake, occurred in many parts of this province a little after 11 A. M. on the 29th ultimo. The shock was preceded by a low rumbling noise, as of distant thunder, and followed by a vibration of six seconds' duration, that caused all the inanimate household gods to quake, and the animate inmates in terror to seek refuge under the canopy of heaven.

The excitement and panic was so universal, that nothing could induce the semi-petrified people for some time to re-enter their houses. A slight repetition of the shock appears to have been felt in some places the same evening a little after dusk. Happily, however, this dire phenomenon in nature has been attended by nothing more serious than a temporary discomposure of the gravity of the muscles, and peradventure a momentary perturbation of the equilibrium of the mind.

"A proposition:—A sovereign prince being desirous to know the organic causes of the phenomenon, consulted his Seer, the Cazi of Joonagher, who solved the problem by stating that the iniquity of the people had become so great and intolerable, that, as a warning to the erratic nation, their mother earth had signified her sore displeasure by an ominous quake. Apparently satisfied with the Mahomedan theory, His Highness immediately proclaimed a day of fast and humiliation, by a liberal distribution of charity amongst the obese and impertinent Fukeers and Gossias, who, vampire like, abound in rajwara domains."

Aboo, 9th May.

"A few days since we experienced a sharp attack of an earthquake here, which appears to have been felt also in many parts of the country. The natives here explain that the earthquake is caused by the god Sudrajee, who is supposed to reside in a certain cave, and to make his way thence through the bowels of the earth, for the purpose of bathing in the Mikee Talao. We have also had rain, a little thunder, and much lightning, but what at first appeared the approach of a very early monsoon, has now cleared off, and the weather has become sunny and hot.

Report of an Earthquake in Kutch on the 29th April 1864, *from Major A. Y. Shortt, Political Agent, Kutch, to the Chief Secretary to the Government of Bombay* (*dated Mandavee, 13th May* 1864).

"I do myself the honour to report that the shock of an earthquake was distinctly felt at about 11 A. M. on the morning of the 29th ultimo in Wagur. It was accompanied by subterraneous thunder, which with the motion seemed to travel from the West to East, and lasted for under a minute, and sufficiently strong to have occasioned damage, had it been of longer duration.

"It seems to have been but slighlty felt in the western part of Kutch, so much so as to have occasioned remarks from but few.

My Delhi letters mention the occurrence of a violent storm of hail, rain, thumder, and lightning on the 29th ultimo. It came on like a common dust storm, but the wind increased to a hurricane, and unroofed houses, uprooted trees, tore limbs from old veterans of long standing, and was so violent while it lasted, that even chairs and tables in verandahs were whirled away by it. The next morning the roads were covered with broken branches and fallen trees lying across them; while in the Queen's Gardens the damage is quite disheartening to the able Superintendent. Such a storm has not been known in Delhi for many years.

It will be seen from the following table, containing the daily mean values of the meteorological elements at Bombay, that convulsion exercised no observable disturbing influence, thereby testifying to the correctness of a principle in science now generally accepted.

Daily Mean Values of Meteorological Elements as observed and calculated in the Government Observatory at Colaba, from 27th April to 3rd May 1864.

Date 1864.	Height of Barometer.			Temperature of Air.	Temperature of Evaporation.	Pressure of Moisture.	Humidity.	General direction of Wind.	Force of Wind.	Weather.
	Uncorrected.	Attached Thermometer.	Corrected to 32° Fah.							
	inches.		inches			inches.			lbs.	
27th April	30·037	85°·0	29·885	84°·2	77°·9	0·863	0·76	NW.	0·3	Cloudy, lightning.
28th „	·021	84·3	·871	83·3	76·9	·838	·76	„	0·7	Do. do.
29th „	29·962	84·4	·846	83·2	77·0	·843	·77	„	0·6	Clouded as above.
30th „	30·014	84·5	·864	83·7	76·6	·821	·74	NW&W.	0·4	Cloudy.
1st May										
2nd „	29·990	84·1	·841	82·7	75·8	·800	·74	N &NW.	0·4	„
3rd „	·989	83·8	·841	82·7	75·3	·743	·72	NNW. & WNW.	0·3	„

Mean Daily Values of Magnetical Elements as observed in the Government Observatory at Colaba from 27th April to 3rd May 1864.

Date Gottingen Mean Time.	Declination Easterly.		Horizontal Force.		Vertical Force.		Observed Dip.	
	Scale Readings.	Are Value.	Uncorrected Reading.	Corrected for temperature.	Uncorrected Reading.	Corrected for temperature.		
	Scal. div.		Scal. div.	Scal. div.	Scal. div.	Scal. div.		On the 28th (19th Göttingen Mean Tmie) or 29th 11*h*. 10*m*. Bombay Civil Time all the Magnetometors were in jumping motion up and down.
27th April	33·475	35·698	20·61	21·51	21·75	21·93		
28th „	33·510	35·940	20·93	21·72	22·02	22·18	19°6·2	
29th „	33·450	35·578	21·06	21·7	21·96	22·12		
30th „								
1st May	33·455	35·544	21·25	22·02	21·90	22·06		
2nd „	33·490	35·770	21·06	21·80	22·04	22·19	19 14·4	
3rd „	33·500	35·861	20·97	21·74	22·11	22·26		

Göttingen day commences nearly at 4 P.M. Bombay Civil Time.

While, on the other hand, the magnetical elements for the same period show unwonted agitation, as will be seen from the following mean daily values obtained through the kindness of Lieutenant Searle, Superintendent of the Bombay Observatory.

I was yesterday informed by Mr. Cole Bayly, C. E., that sitting in his office at Surat the shock felt by him was 11-10, exactly railway time, proceeding in a direction from South to North, and that he sent telegrams to various stations for information. I regret that I have not had time to procure these facts ; but I hope to have them before the next Meeting when I shall place the result before the Society :—

Table of particulars about the Earthquake felt in Guzerat on the 29th April 1864.

Place of Observation.	Date.	Time of Observation.	Direction of Oscillation.	Period of Oscillation.	Remarks.
Ahmedabad	1864 April 29th	11 15 A.M.	South to North	20 Seconds	The noise preceding and accompanying the shock was like that made by a heavy carriage running on a hard road.
Surat	,,	11 30 A.M.	N. to S.	2 Minutes	
,,	,,	11 A.M.	E. to W.	Do.	
Tikhal in Surat Districts	,,	11 13 A.M.	W. to E.	....	
Kaira	,,	10 55 A.M.	From S.W.	1 Minute	It produced a feeling of sea-sickness.
Dhollera	,,	10 45 A.M.	From N.W.	30 Seconds	
Wagur	,,	11 A.M.	W. to E.	1 Minute	

ART. XX.—*Report on Dhur Yaroo in the Shikarpoor Collectorate.* By Assistant Surgeon J. LALOR, B. A. *Contributed by Government.*

Read before the Society, December 15th, 1864.

THE plateau of "Dhur Yaroo" is situated amid the great Halla range of mountains in 27°30′ North latitude, 67°17′ East longitude, and about seventy miles West of Larkhana in the Shikarpoor Collectorate. To the foot of the hills and low outlying ridges there is a good made road, and at Hummul, on the Western Trunk road marked out by General Jacob, a bungalow, conveniently enough placed to be used on the journey.

The country here is about seven hundred feet above the level of the sea, and the route from this to Tridak, or the point of convergence of three great spurs of hills, is for the greater part circuitous and difficult. First to Peer Godra (where there is always water), about eight miles across a rich plain of reddish brown loam eagerly cultivated in wet seasons; second over low hills of sandstone and conglomerate pebbles to Onahar. The distance is nearly the same as last stage, and water only to be found after rain.

Thence to Tridak, about twelve miles, the road lies mainly through the beds of mountain torrents and over some low ridges, which may be said to constitute the first range, and are composed chiefly of loose grained red sandstone intermixed with pieces of grey nummulitic limestone. This portion of the journey is difficult, but the road is capable of some improvement, and is now passable for horses and lightly laden camels. At the halting place there is always water in the hot season.

Hill camels and ponies can go between Tridak and Dhur Yaroo—a distance of twelve miles. For three miles the ascent is steep to the top of Peheroo—a well defined range running nearly North and South, sloping Eastward towards the plains with a bold scarp Westward. Here the cool breezes begin, and it is doubtful if the hot winds ever reach so far; height about 4,000 feet.

ROUGH SKETCH PLAN
of the
DHAR YARD PLATEAU
on the Summit of the
KEERTHAR RIDGE
of the
HALA RANGE,
KARRAN DISTRICT.
SIND.

From this there is again a sharp descent of one thousand or twelve hundred feet into the Kertch Valley, which is about four miles across, and studded with heaps of loose shingle, or masses of low hills composed of yellowish grey clay capped with sandstone. These lead up to the foot of the third range, on the top of which is the table land of Dhur Yaroo.

This is called the Keroothur range, strikes North and South, dipping East with a gradual incline West towards the plateau. The incline is however interrupted in one or two places by irregular spurs.

Thus Dhur Yaroo is situated on the top of the Keroothur, and again subtends the Keerthur or Kara Tukkur—here the great natural Western boundary of Sind and Beloochistan. A glance at the accompanying sketch, copied from one of Captain Macdonald's, of the Revenue Survey, will show the position at once.

Boundary.

There is a considerable discrepancy between the Political and Geographical boundaries at this place. In the former the Keerthur is bandoned for four or five miles at a point South called the Kutt-jo-Khubbur (Dog's Tomb), and an irregular spur, running Eastward and joining the regular range at Ved, adopted; thus making Dhur Yaroo in Khelat territory. The latter retains the Keerthur, which is accepted by all as a frontier line from the point Southwards where the Hubb river takes a Westerly course up to the Kuttâ-jo-Khubbur, a distance of about one hundred miles and again from Ved point to Khyree Ghurree in the Jacobabad districts. This is undoubtedly the natural and scientific boundary; as the Western dip of the range is almost perpendicular, varying from 1,000 to 1, 500 feet; while the incline Eastwards and the water shed are equally well defined and easily established.

Drainage.

The ground on this slope at the back or to the West of the plateau, is much cut up by water-courses running from West to East, and draining into one deep and long ravine with a direction nearly NE. and SW. Here water is to be found in pools difficult of access in all ordinary seasons. A similar ravine runs through the table land itself and contains water at times. By these two the drainage of the slope and plateau—an extent of perhaps fifteen square miles—is carried N.

and E. into Sind. First, into a spring of fresh water at a point Northwards called Guddâ-jo-puchro (Donkey's tail) in the country of the Gaichas, a tribe owing allegiance to Chybee Khan Chandia. It then in part disappears and breaks out again about five miles further East, and two thousand feet lower down into a fine perennial river, in which fish are found almost at the point where the water rushes out from the rocks. The edges of the stream are fringed with ferns and the banks covered with wild Oleander, Peepul, Tamarisk, and two varieties of Acacias. The drainage is shown by the light blue lines in the sketch.

Cultivation and Inhabitants.

There are probably upwards of one thousand acres of cultivable land at Dhur Yaroo. The soil is a yellowish red marl, washed from the hills, in some places of considerable depth, and in favourable seasons will yield two crops.

The inhabitants are Chootas, a Sindee tribe of Juts, whose Chief, Oomed Ali, lives near the Hubb river, and about fifty miles from Kurrachee. How they came to settle here apart from their tribe is uncertain, but though they have given aid to the Chandias in their quarrels with the Mugzees and other Belooch tribes, fear, and not a sense of allegiance, was apparently the cause.

The height of the plateau above the sea, as obtained by repeated experiments on the boiling point of water, is about six thousand feet. The hills bounding it on the East are fully three hundred feet above this level ; those on the West (Keerthur) seven ; while the Dog's Tomb —the point of junction of the Eastern spur with the main range—is twelve hundred feet. This is the highest point in those mountains, and is visible during the cold season from most places in the Shikarpoor Collectorate.

It will be thus seen that Dhur Yaroo is well protected all round, and not so exposed to the high winds that render other elevated points in those hills so disagreeable and often unbearable.

The ranges are composed of red sandstone intermixed, especially in the Peheroo range, with nummulitic and a smooth and friable whitey-grey limestone. Fossils free and imbedded are abundant here.

A whitish shaly limestone, often considerably polished, apparently from water action, enters largely into the composition of the higher

ridges, particularly the Keerthur. In this range fossils are scarce. The under surfaces of all disintegrated slabs and loose pieces of rock are covered with a coating of brown hæmatite, which gives a curious reddish appearance to the pathways and sheep tracks.

General Features.

After rain the mountains become covered with grass, and during the whole hot season afford pasturage to large and numerous flocks of goats and dhoombas, or the fat-tailed sheep of the hills. The mutton is excellent, and the tail weighs from five to seven pounds. This fat is highly esteemed and supercedes the use of ghee among the people; but sometimes endangers the life of the animal, as wolves will take the tail and spare the sheep.

The wild animals found are the Wolf, Hyena, Black Bear, and Fox: Cheeta and Panthers are said to be seen sometimes. About the middle ranges Ibex may be met with, but they are very shy, and afford only indifferent sport in the hot season at least; while in the lower hills the Gud (wild sheep) are found in small herds in much more accessible places and easily to be got at during the cold weather. Among the birds may be mentioned the Goshawk and a very large variety of Vulture, with a golden breast and some of the characteristics of the Eagle. Ravens migrate from here to Sind during the early part of winter. A fine variety of grey Pigeon, handsomely marked with a white bar across the back of the wings, appears peculiar to this place. All through the hills there is found a species of red-legged partridge, with black spots on the breast and under the wings, and a call resembling the ordinary farmyard fowl.

There is also a curious variety of Quail, the male bird resembling the Partridge, and only to be distinguished by its smaller size and by yellow instead of red legs and bill. The female is very different, of a darker brown color, and with small silvery grey spots on the back. But few reptiles are met—A very unsightly, shiningly black Iguana, the small yellow scorpion, and many kinds of snakes. The only venomous one killed or seen was the well known "Loondi" of Sind.

Among the plants peculiar to the hills we find but few deserving notice, and the same may be said of the shrubs and trees. The "*Celtis Serratina*" (Rohree) is a fine tree, the expanding branches and dense foliage of which afford good shelter. It grows only in the deep ravine

which runs through the plateau, is said to have been introduced by a Fakeer, and is not to be met with elsewhere in these ranges.

The common fig (*Ficus Carica*) grows wild, and yields a small and eatable fruit. Acacias, (*Arabica and Spicigera*) "Babul, and Kendi" grow abundantly in the Kertch Valley, but are very stunted and only fit for firewood. The white stemmed or Cabul Acacia may be also seen higher up.

Salvadora Indica and Persica, the former to be found in the middle ranges, produces an edible berry (Peloo) about the size of a red currant, and not unpleasant to the taste. The wood is hard, resists the attack of white ants, and is much prized. The latter (Kusseer) is only to be met with in the very lowest hills and near torrent beds. The berry is highly aromatic and disagreeable, and the outer part or bark of the roots raises blisters. It is supposed to be the mustard tree of Scripture. There is another undetermined variety of *Salvadora* (Wasnaoo) which grows in the very highest and most inaccessible places. The greenish red berry is acrid, and the leaves and red-leaf stalks contain follicles of essential oil which yield a heavy aromatic smell on pressure. It gives out in burning a powerfully offensive and sickening odour, and should be carefully avoided as firewood. The wild almond, Badam-jofœtah (*Termanelia Catappa*) never attains a serviceable size—fruit small and useless, the young stems make handsome walking sticks, and resemble the Hazel wood. "Khow" (*Olea Cuspidata*) grows extensively through the hills. Its dark-coloured and finely grained heartwood is much esteemed for turning purposes. "Loheroo" or iron wood (*Tecoma Undulata*) is the hardest wood known. This tree may be considered a fair mark of altitude, and will be hardly ever found growing at any point below two or above four thousand feet. It bears abundant and handsome orange flowers. A wild variety of "Phalsa" (*Grewnia Asiatica*) and the small "Lesoree" (*Cordia Myxa*) afford eatable berries, as do likewise the "*Capparis Aphylla*" and *Galeata* (Kurreel and Kulvery). The former is to be met with below; the latter all over the mountains. A stunted and shrubby vairety of the Indian Coral tree "Mandar" *Erystrina Indica* grows in the ravines.

The flowers of the mountain "Kip" (*Periploca Aphylla*) are eaten, but unlike the variety found in the plains of Sind, it is not used as a fibrous plant.

Of the herbs there are few in use, though the species are numerous. Spear Mint, Catmint (Dathro), a variety of sweet Marjoram, and on the top of the Kuttâ-jo-Khubbur, a kind of lavender. The Convolvulus of kinds—*Argemone*, &c. are all to be met.

But the great plant of the country is the "Peesh" (*Chamerops Ritchiana*), a kind of under-sized fân-palm. Its uses constitute quite a feature of the nomadic life of the hill tribes. From the leaves are made mats for bedding, for the walls and roofs of houses, sandals, ropes, pipes, and drinking cups. The fruit and young stem are eaten, the former is fleshy and tasteless, but the latter is much esteemed and has something of the flavour of raw chestnuts. From the decayed parenchymatous issue an excellent tinder is procured. Besides the above there are two other plants producing edible berries—"Mukkoo" (*Solamum Decendentatum*) and "Punneer," an undetermined variety of Physalis. The fruit is known in Sind under the general name of "Peroo": these, with the common yellow wood Sooree "Ambootee" (*Oxalis Corniculata*), to be found in the ravines, are all that merit notice.

Climate.

Having thus given a brief outline of the leading typographical and natural features, it will now be more readily seen how and to what extent they effect or modify the chief elements of climate.

Solar Radiation.

All atmospheric heat as ordinarily understood is generated by solar radiation, and as the distance here from the tropics is only a few degrees, the rays of the sun are nearly vertical, and there being no vegetation calculated to arrest or aid in producing evaporation or clouds, they act generally through a perfectly clear atmosphere, with considerable power and a glare very overpowering. But the great height of the situation and the lightness and elasticity of the atmosphere, which diminish the capacity of the air for heat, is such that the slightest shade insures comparative coolness. Some idea of the extent of this diminution in the capacity of air for heat according to altitude, may be formed from the statement of "*Sanssure*" that "temperature decreases one degree in every hundred yards of ascent."

Again, the earth radiates heat, and as all the conditions—high position and a clear sky—are favourable, the action is powerful, and consequently the nights and early mornings are always thoroughly

enjoyable. The greatest height shown by the Thermometer in experiments on solar radiation was 148°; while at Larkhana at the same time and under similar circumstances, namely, with the bulb wrapped in a dark coloured cloth, and the instrument placed horizontally on the ground in an exposed position, 170° was shown. This is opposed to the theory that " the calorific effects of the sun increase as we ascend," or it may be that the Thermometer is only a measure of the accumulated free heat.

Moisture.

The experiments on moistnre showed very favourably in April and the early part of May. The mean depression of the wet bulb thermometer varied between 2° and 9°, but towards the end of May and in the month of June, increased to 12° and 23°. In August there were some showers of rain, and the atmosphere was generally moist. Mean depression only a few degrees, and during the night a good fall of dew.

Winds.

North-west winds prevailed in the early part of the season. These were always cold, but often disagreeably high and raw. The Southerly breezes in the end of May and after were very pleasant at night, but died away generally from early morning to mid-day, leaving the atmosphere oppressive for out-door exercise.

Rain.

Heavy rain and hail fell in April and May. It generally came from the North-west and West; the showers never lasted more than half an hour; were ushered in by high cold winds, and always followed by cool and delightful weather. The later rain came from the East and North-east, and was no doubt the result of the rising of the river and spread of the water over the plains. It was always preceded by days of cloudy weather, during which the temperature was most enjoyable, and out-door exercise might be taken without inconvenience.

About six inches of rain fell in all. Seven-eighths of this was in the early season. An interval of fifty-one days elapsed between the end of May and the 20th of July without any, and then but a shower of half an hour's duration. This distribution appears unusual. As a rule the natives apprehend drought in the early part of the year, and look forward to a healthy supply of water about July. The seasons vary

accordingly, but the late rains are more general and preferable, as they both temper the heat, which is then at its height, and also enables the land to be prepared and the crops sown before the people leave the hills in September, or early in October.

Heat.

The temperature will be most readily shown by contrasting in short comparative tabular statements the "Means" of the monthly observations made with the Thermometer at the two stations of Dhur Yaroo and Larkhana, and also the mean daily variations.

Register of the Mean Monthly ranges of the Thermometer at Dhur Yaroo for the latter half of April and the months of May, June, July, August, and early days of September 1864.

Months.	Average.				Mean daily variation.
	6 A. M.	9 A. M.	Noon.	4 P. M.	
April	60°	68°	68°	67°	6° 30′
May	63	70	71	66	4·25
June	71	79	80	80	12·20
July	75	79	81	81	9·35
August	68	77	81	77	10·93
September . ..	65	77	77	74	13·44

Register of Thermometer for the same periods at Larkhana.

Months.	Average.				Mean daily variation.
	6 A. M.	9 A. M.	Noon.	4 P. M.	
April	75°	78°	85°	94°	19°
May	83	87	91	98	14·75
June	85	88	94	102	16·01
July	88	96	98	100	12·32
August	84	95	97	99	14·12
September . ..	83	84	86	90	7·44

From these tables it may be seen that the heat is never excessive. In a good house with a verandah it would never be oppressive, and the variation would always be a minimum. As it is, it appears trifling compared with the other table. In September the dews at night, and consequent coldness in the early morning, make it more by 6° than at Larkhana. In June the heat from 8 A.M. until 2 P.M.. was considerable, hence the 12° 20′.

The minimum Thermometer sometimes marked in April as low as 41° and 43°, but in the following months the nights were very equable in temperature, at least at the different intervals on which I experienced them. Some were rather cold, and there were very few during which blankets could be conveniently dispensed with.

Having thus given the chief natural and climatic features of Dhur Yaroo and its immediate neighbourhood, I would, before concluding, venture a few remarks on its utility as a place of resort for Europeans in N. Sind during the hot season.

The word Sanitarium cannot with justice be used in connection with the place, as the exertion required to reach it involves a considerable amount of constitutional vigour, and the change would be too sudden and the atmosphere too light and stimulating for a sick or weakly person. Such a one would find it raw and disagreeably cold in April and early May, as he had not been in the necessary training. Again in June, July, and early August the hot winds during the journey and first part of the ascent would render the attempt eminently hazardous for a sick man.

In September it might be suitable, and probably in October, but as the inhabitants leave in the early part of this latter month at latest, it is to be inferred that it must be very cold, and the cold of a biting and disagreeable nature, as the people are hardy and enduring.

But putting aside the question of a Sanitarium, which can be had in the highest degree at Kurrachee, Dhur Yaroo ought to be with many officers in Upper Sind a place of great importance to which they can retire from the intense heat of the plains, and for a time carry on their official work, instead of imperilling their health, sometimes to a hopeless extent, and generally to a degree that obliges them to relinquish their charges much sooner than they desire or are prepared for.

The house or shed built by the Commissioner in Sind is very comfortable, and considering the limited European population of Upper Sind, sufficiently large for the accommodation of visitors.

Water is generally scarce, but is, I think, to be had every season and in sufficient quantity under all ordinary demands. The fine new tanks, or rather the bund thrown across a wide and deep natural hollow, will, if it stands, amply provide for the wants of all, unless the season should be unduly unpropitious and rainless.

The annexed tables show the register of the Thermometer as kept in the Commissioner's Camp at Dhur Yaroo inside the bungalow. The minima whenever given were taken outside, the Thermometer hanging on the wall. The 6 A. M. registration for July and August was generally made in the same way.

At Larkhana the register was kept at the Dispensary, a good building with a verandah. The instrument was exposed to any breeze that blew from S. or SE., but protected from the hot winds.

Register of Thermometer at Dhur Yaroo for the Month of April 1864.

Dates.	6 A. M.	9 A. M.	Noon.	4 P. M.	Remarks.	
1	..	..	..	..		
2	..	..	..	..		
3	..	..	..	..		
4	..	..	..	..		
5	..	..	..	..		
6	..	..	..	..		
7	..	..	..	..		
8	..	..	..	..		
9	..	..	..	..		
10	..	..	..	..		
11	..	..	..	..		
12	..	..	..	..		
13	..	..	..	..		
14	..	..	..	..		
15	..	..	..	..		
16	58	59	61	61	Cloudy. Wind S. + Min.	50
17	56	58	60	62	Thunder. Rain 4 P M. S. + ,,	49
18	53	59	61	61	Cloudy. Wind S. E. + ,,	43
19	58	62	67	67	Clear. Wind N. E. ,,	41
20	62	63	66	66	Do. Variable. ,,	51
21	62	64	64	67	Do. E. ,,	51
22	63	64	66	67	Do. Do. ,,	52
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24	63	69	69	69	Do. Do. ,,	53
25	64	70	70	70	,, ,,	59
26	..	..	..	..	,, ,,	61
27	..	..	..	..	,, ,,	—
28	62	71	71	73	High wind cloudy and mist,,	61
29	63	71	72	72	Do. ,,	62
30	63	70	69	70	Do. Very cold at night ,,	61

For the Month of May 1864.

Dates.	6 A. M.	9 A. M.	Noon.	4 P. M.	Remarks.
1	68°	72°	73°	72°	Wind E. and SE.
2	69	73	74	75	E.
3	70	74	74	75	Rain 7 P. M.
4	68	70	72	65	Thunder and rain W. and NW.
5	66	68	70	70	
6	65	69	70	70	
7	62	70	70	70	
8	63	66	68	67	Thunder and rain NW.
9	65	68	69	69	
10	64	69	70	72	
11	65	70	74	71	Cloudy and hail storm N.
12	..	..	..	..	
13	61	70	70	69	Heavy rain and hail NW.
14	60	68	66	70	
15	64	68	68	65	Heavy rain W.
16	64	68	68	64	Rain W. and S.
17	62	62	63	65	Heavy hail and rain W and SW.
18	62	62	63	65	Rain SE.; cloudy.
19	62	64	66	63	Do. do.
20	59	62	64	65	Do. slight S.
21	62	64	65	67	Cloudy; thunder slight; rain.
22	64	65	65	67	Heavy rain at noon NW.
23	66	65	65	68	
24	66	70	70	72	
25	66	68	70	70	
26	..	..	..	..	No breeze; hot and close.
27	78	80	82	82	Do. do. do.
28	80	85	86	84	SES. do. do.
29	74	84	86	83	Thunder and lightning.
30	74	82	83	82	Do. slight rain N. and NW.
31	64	78	82	63	Heavy rain at 4 P.M. NW.

For the Month of June 1864.

Dates.	6 A. M.	9 A. M.	Noon.	4 P. M.	Remarks.
1	73°	76°	76°	79°	NW. high and stormy.
2	74	75	76	76	Do. do.
3	65	74	76	76	Stormy.
4	64	75	76	76	SSE.
5	65	75	76	76	SSE. slight.
6	65	76	76	79	SSE. slight breeze.
7	66	76	77	80	Do. do. 10° difference wet bulb.
8	67	78	79	81	SWW. same
9	70	80	80	82	Do. sifter breeze.
10	70	80	82	83	Do. do.
11	70	81	83	82	Do. clouds towards NW.
12	72	81	82	82	Do. do.
13	71	81	82	82	ESE. clouds.
14	73	81	82	83	SE. hazy.
15	73	82	82	83	W. do.
16	71	81	82	83	NW. do. clouds.
17	70	80	82	86	Do. do.
18	73	79	81	82	SSE.
19	74	81	82	82	NW. hazy.
20	73	81	82	82	SEE. clouds.
21	73	81	81	81	SE. do. thunder.
22	73	80	78	79	Do do. do. and slight rain.
23	73	80	83	77	NW. slight rain and high wind.
24	73	82	82	74	Do. do.
25	70	78	79	79	Do. do.
26	70	79	80	80	SE.
27	74	82	84	84	Do.
28	74	83	84	86	Do.
29	76	83	86	88	SW. high wind; dust.
30	75	81	84	86	Do.

For the Month of July 1864.

Date.	6 A. M.	9 A. M.	Noon.	4 P. M.	Remarks.
1	74	78°	79	86°	
2	74	80	83	84	SE.
3	74	81	82	84	Do.
4	74	82	86	84	
5	74	84	86	84	E.
6	78	84	85	84	E.—Cloudy.
7	78	84	85	84	,, ,,
8	76	81	82	81	,,
9	75	82	81	81	
10	74	80	81	81	
11	73	75	76	74	Rainy.
12	70	76	77	78	
13	70	76	79	82	Cloudy.
14	70	80	83	81	Do.
15	71	80	85	83	Do.
16	72	83	84	82	Do.
17	72	82	83	84	Do.
18	72	82	84	83	Do.
19	72	82	84	83	Do. thunder and slight rain.
20	72	82	82	81	
21	71	76	77	75	Thunder and heavy rain NW.
22	69	76	75	75	Cloudy N. and W.
23	65	78	77	75	
24	71	79	78	76	Do. thunder.
25	71	76	78	78	Misty; cloudy.
26	72	79	82	80	Thunder; do.
27	73	70	82	81	Do.
28	74	80	85	84	Rain.
29	74	82	84	84	Slight thunder and lightning.
30	75	82	83	83	Shower of rain.
31	74	84	84	83	Do. do.

For the Month of August 1864.

Date.	6 A. M.	9 A. M.	Noon.	4 P. M.	Remarks.
1	74°	82°	84°	83°	Cloudy W. and E.
2	76	81	73	74	Thunder ; heavy rain.
3	75	78	82	83	Do. few drops of rain WNE.
4	74	82	82	81	Do. do. WW. up till noon.
5	76	82	83	82	Do. clouds
6	75	81	82	81	Clouds, few drops of rain WW. up till noon.
7	72	79	83	82	Do. WSE.
8	73	80	82	81	Few clouds WNW.
9	73	80	81	81	Clouds NW.
10	68	79	80	80	Do. thunder NW.
11	68	79	82	81	Do. do. slight rain WN. at 9 P. M.
12	68	78	79	78	Do. do.
13	68	78	79	78	Do. do.
14	67	78	78	80	Do. do. Heavy rain WNE.
15	67	75	76	76	Many clouds. Thunder, dust storm, mist NNE.
16	69	75	76	76	Clouds WNE. Clear wind.
17	67	78	78	77	Do. Thunder WNE.
18	66	77	78	77	Few clouds WNE.
19	67	79	77	77	Clouds.
20	66	77	77	76	Do. S. and W.
21	67	77	76	75	Do. thunder W.
22	*70	74	74	72	Do. do. rain. Min. 62
23	58	72	72	71	Cloudless light S. and E. breeze.
24	57	72	73	73	Do. do. do.
25	59	73	74	72	Do. do. do.
26	61	74	76	76	Light clouds do. do.
27	65	75	76	76	Fleecy do. W.
28	66	77	78	78	Do. do. slight thunder.
29	65	77	78	77	Do. do.
30	62	78	79	77	Do. do. slight thunder.
31	65	79	79	78	Heavy clouds—thunder.

* Inside.

For the Month of September 1864.

Dates.	6 A. M.	9 A. M.	Noon.	4 A. M.	Remarks.
1	66°	78°	80°	78°	Clouds.
2	66	76	79	76	Do.
3	63	75	78	75	Do.
4	65	77	77	75	Do. Mist.
5	62	77	78	76	Do.
6	65	78	77	76	Do.
7	67	78	79	78	Cloudless; high S. wind at night.
8	67	79	80	78	
9	67	77	80	77	

Register of Thermometer at Larkhana for the Month of April 1864.

Date.	6 A. M.	9 A. M.	Noon.	4 P. M.	Dates.	6 A. M.	9 A. M.	Noon.	4 P. M.
1	..	..	..	..	16	74°	77°	83°	92°
2	..	..	..	..	17	74	78	83	92
3	..	..	..	..	18	74	76	83	92
4	..	..	..	..	19	75	78	84	93
5	..	..	..	..	20	77	79	82	97
6	..	..	..	..	21	78	80	87	96
7	..	..	..	..	22	77	80	88	98
8	..	..	..	..	23	75	79	85	92
9	..	..	..	..	24	76	77	80	94
10	..	..	..	..	25	76	78	82	96
11	..	..	..	..	26	76	78	82	96
12	..	..	..	..	27	79	80	87	97
13	..	..	..	..	28	74	80	84	94
14	..	..	..	..	29	73	79	83	93
15	..	..	..	..	30	74	81	85	95

For the Month of May 1864.

Dates.	6 A. M.	9 A. M.	Noon.	4 A. M.	Dates.	6 A. M.	9 A. M.	Noon.	4 P. M.
1	85°	87°	90°	95°	17	81°	84°	89°	98°
2	84	86	90	96	18	82	85	86	97
3	84	86	90	96	19	82	87	90	98
4	83	85	89	95	20	81	86	89	98
5	83	85	89	95	21	81	86	88	97
6	85	88	90	99	22	82	87	90	98
7	85	88	90	98	23	84	86	90	97
8	84	87	92	97	24	82	85	88	94
9	84	87	92	97	25	84	88	92	98
10	85	88	94	99	26	86	90	94	102
11	83	85	91	98	27	84	91	95	103
12	84	86	91	98	28	84	91	96	104
13	85	89	92	99	29	85	93	95	105
14	84	88	91	98	30	86	91	94	104
15	85	89	92	99	31	85	90	94	103
16	82	86	89	97					

For the Month of June 1864.

Dates.	6 A. M.	9 A. M	Noon.	4 P. M.	Dates.	6 A. M.	9 A. M.	Noon.	4 A. M.
1	83°	85°	93°	102°	16	85°	89°	93°	100°
2	84	86	94	103	17	86	90	94	101
3	84	86	94	103	18	86	91	94	102
4	83	85	93	103	19	88	92	96	104
5	83	86	95	104	20	86	91	94	102
6	84	87	95	104	21	87	93	95	102
7	84	87	95	103	22	87	90	94	101
8	83	86	94	104	23	88	91	95	102
9	84	88	94	103	24	89	91	96	102
10	83	87	93	102	25	89	92	95	101
11	84	89	94	103	26	89	92	95	101
12	85	89	93	102	27	88	92	95	102
13	85	88	92	101	28	89	95	98	104
14	84	89	92	100	29	89	94	97	103
15	85	89	93	100	30	89	95	98	103

For the Month of July 1864.

Dates	6 A. M.	9 P. M.	Noon.	4 P. M.	Dates.	6 A. M	9 A. M.	Noon.	4 P. M.
1	90°	96°	100°	102°	17	88°	97°	99°	101°
2	88	96	100	102	18	89	97	99	100
3	88	98	99	101	19	90	98	99	101
4	86	98	99	100	20	91	98	99	101
5	85	96	98	100	21	92	98	99	100
6	85	95	97	100	22	92	98	99	100
7	86	97	98	100	23	92	97	98	100
8	86	96	98	100	24	91	97	98	100
9	87	98	99	100	25	92	96	98	100
10	88	98	99	100	26	92	96	98	100
11	86	96	98	101	27	91	96	98	101
12	86	96	98	100	28	88	94	98	101
13	86	96	99	101	29	86	97	98	100
14	87	97	99	101	30	85	95	98	100
15	87	97	99	101	31	85	97	99	101
16	88	97	98	100					

For the Month of August 1864.

Dates.	6 A. M.	9 A. M.	Noon.	4 P. M.	Dates.	6 A. M.	9 A. M.	Noon.	4 P.M.
1	85°	96°	98°	101°	17	86°	96°	97°	100°
2	85	96	98	100	18	86	95	97	100
3	86	98	99	100	19	85	95	97	101
4	85	98	99	100	20	85	95	97	99
5	86	98	99	100	21	84	95	97	99
6	85	97	99	100	22	83	94	96	99
7	85	96	98	102	23	83	93	96	98
8	86	97	99	101	24	83	93	96	97
9	86	97	98	102	25	82	93	94	97
10	86	99	100	101	26	82	93	94	96
11	87	98	99	100	27	83	92	94	96
12	86	97	98	101	28	83	93	94	95
13	87	96	98	100	29	82	92	93	94
14	87	96	98	100	30	82	92	93	95
15	86	96	97	100	31	82	92	93	94
16	87	96	97	100					

For the Month of September 186

Dates.	6 A. M.	9 A. M.	Noon.	4 P. M.	Remarks.
1	85°	86°	88°	91°	
2	84	86	87	91	
3	84	85	87	91	
4	84	85	86	90	
5	83	84	85	90	
6	83	84	85	90	
7	82	83	84	91	
8	81	84	86	91	
9	82	84	86	90	

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